ARCTIC RESEARCH AND POLICY ACT OF 1981

HEARINGS

BEFORE THE

COMMITTEE ON GOVERNMENTAL AFFAIRS
UNITED STATES SENATE

NINETY-SEVENTH CONGRESS

SECOND SESSION

ON

S. 1562

TO PROVIDE COMPREHENSIVE NATIONAL POLICY DEALING WITH NATIONAL NEEDS AND OBJECTIVES IN THE ARCTIC

APRIL 7 AND JUNE 17, 1982

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ARCTIC RESEARCH AND POLICY ACT OF 1981

WEDNESDAY, APRIL 7, 1982

U.S. SENATE,
COMMITTEE ON GOVERNMENTAL AFFAIRS,
Fairbanks, Alaska.

The committee met, at 10 a.m., at the University of Alaska, Hon. Ted Stevens, presiding.

Present: Senator Stevens.

Also present: Senator Murkowski.

Staff present: Tonja Musko, staff attorney to Senator Stevens, David Garman, legislative assistant to Senator Murkowski, Wallace Burnett, staff assistant to Senators Murkowski and Stevens, and Dr. William E. Davis, Office of Technology Assessment.

OPENING STATEMENT OF SENATOR STEVENS

Senator STEVENS. We're here this morning to hold a hearing for the Senate Committee on Governmental Affairs, on Senator Murkowski's bill, which is S. 1562, the Arctic Research and Policy Act of 1981.

Our first witness will be Mayor Ruth Burnett from the city of Fairbanks. And then following that, Ralph Andersen of the North Slope Borough.

I have an opening statement. We're late, and I'm going to put the statement in the record in full, but let me say that we feel that the initiative that Frank has taken in proceeding with this bill with the bipartisan support of Senator Jackson of Washington, and I believe there will be others, is a very significant one. The Arctic has a special meaning to us as Alaskans. We think it has a special meaning to the United States and to the world.

We're hopeful that this hearing will establish a record to demonstrate to the members of our committee that the bill should be reported, and also demonstrate to the administration that the whole concept needs the support of the executive branch. I will file my statement.

[The prepared statement of Senator Stevens follows:]

PREPARED STATEMENT OF SENATOR STEVENS

Arctic Research needs are expanding and accelerating. The country as a whole, and Alaska in particular, need a strong background of hard scientific data on which to base decisions. As we look toward a future in which national defense and national energy needs will assume even greater importance, it becomes imperative to have a unified and coherent national Arctic science policy.

For years, science in the Arctic has developed in boom-bust cycles. Research has been purely "reactive"—it occurs as an immediate response to a particular problem. What has been lacking is a long-range planning capacity that will give science research stability and prioritize its goals. Without such a policy, scientific research will remain fragmented and prone to unnecessary duplication, waste and expense.

The Arctic has a special and unique significance to this nation. It is our only common border with the Soviet Union. Its geographical location gives the Arctic immense strategic importance. Furthermore, Alaska oil and gas currently comprise 17 percent of domestic production, and that percentage is expected to increase dramatically. Alaska coal and strategic minerals will allow the United States to achieve a greater degree of energy independence. In addition, our fisheries and other renewable resources are one of the country's biggest commercial assets.

There are other, less-obvious areas for scientific research that are important to all Americans. The adaptations of plants and animals to Arctic conditions are a unique field of biological inquiry. The existence of active tectonic zones, with their volcanoes and earthquakes, makes Alaska an ideal location for the study of geo-physics Arctic atmospheric conditions, such as the Northern Lights and other electromagnetic phenomena, are incompletely understood. An Arctic science policy would help to illuminate the "greenhouse effect" of carbon dioxide in the atmosphere, which some argue could melt the polar ice cap, while others predict another ice age. The Arctic oceans are important not just for their impact on global weather, but for exploration of sea ice, water dynamics and marine life that can exist in extreme cold.

Basic research provides the groundwork for technological development. A better understanding of ice flows and Arctic engineering would permit safer development of offshore oil. Knowledge of sea ice opens the way for more advanced ice-breaking technology, a field in which we are admittedly far behind the Soviets. Understanding of how the Arctic climate affects global weather patterns could aid agricultural management all over the country. a study of marine currents and ice movements would pave the way for marine transportation that would make development of our energy resources more lucrative. We can use information on permafrost and weather patterns to solve our pressing habitation problems; from siting and building of housing to energy conversion, waste disposal and farming. Investigations into animal behavior would enable us to protect wildlife and the people who depend on them. There is no end to the list of areas which scientific research would lead to applied technology that would allow us to obtain our resources without inflicting irreparable harm on the land or its people.

I want to emphasize that although there has been a great deal of research done in the Arctic, it is spread out among so many different agencies that access to it is, in a practical sense, impossible. Fifteen different federal agencies currently have missions in the Arctic. Cooperation among them is practically non-existent. Both the nation and the people of Alaska lose because of this inefficiency.

The Arctic Research and Policy Act, which we will hear testimony on today, will begin to remedy the factors that have impeded Arctic research from its inception. First, the Act would fund both basic and applied research into all subject areas of Arctic significance. Second, it would set up a central data collection and retrieval center. As a result, there would be a new spirit of cooperation among the federal and state governments, the Native community, and private industry. A national Arctic policy would also provide a framework for an international policy.

Chairing the hearing with me today is Senator Murkowski, who has introduced this bill, which I was happy to cosponsor along with Senator Jackson.

Senator STEVENS. Frank, do you have an opening statement?

OPENING STATEMENT OF SENATOR MURKOWSKI

Senator MURKOWSKI. I have an opening statement, Ted. There are some that would suggest that since two U.S. Senators were on the airplane this morning, that's why it was delayed by air traffic controllers, but Ted and I have suggested that in lieu of that you write your congressman if you're concerned with the delay, rather than your Senators.

Senator STEVENS. No—not your Senators.

Senator MURKOWSKI. So with that, it's certainly been a pleasure to have received the encouragement from Ted Stevens, his staff, Senator Jackson, and a number of others who are going to get behind S. 1562. It happens to be my first major piece of legislation. It's certainly relevant to Alaska, and I think it provides an opportunity for a harmonious blending of talent that we have in our State with the Federal Government, the University of Alaska, the Alaska scientific community, certainly Alaska's private sector, and of course, Alaska's Native community, which is one of the major groups that will be affected by Arctic development and consequently necessitates Arctic research. I think it offers an opportunity for a partnership, and I do want to assure those in the private sector that might be concerned, that such a proposal would perhaps complicate any potential arctic development. That is certainly not the intent. It's to harmoniously blend the talents that are available for the obvious successful objective of a greater understanding of the potential of the Arctic by garnering and communicating more knowledge and sharing that knowledge.

I want to thank you, Senator Stevens, for holding this hearing in Fairbanks. I think it's most fitting that we are here at the University of Alaska, and I certainly welcome with you the witnesses that we are about to hear from.

[Senator Murkowski's prepared statement follows:]

PREPARED STATEMENT OF SENATOR MURKOWSKI

I would like to begin by thanking Senator Stevens and the Senate Committee on Governmental Affairs for holding these hearings in Fairbanks this morning. I think it is important for us to come up here to hear from some of the Alaskans who have a large stake in whether or not this nation has a coordinated Arctic research policy.

I believe a national Arctic science policy is crucial if we are to develop research goals, provide for information exchange, establish priorities, and facilitate international cooperation in order to meet the challenges which lie ahead of us in the Arctic. Today, the Federal government generally takes an ad-hoc approch toward research in the Arctic. Instead of planning ahead to build a foundation of knowledge and data that will help us answer future questions that we cannot even anticipate today, we seem to be satisfied to address the problems after they have become problems. We react to needs only after they become acute. We do not plan. We do not anticipate. We merely react.

It is not difficult to see the folly of this approach. If we continue as we have, we will pay a higher cost over the long term—whether it is measured in terms of dollars, environmental disruption, needless delays in resource development, or human suffering.

I introduced S. 1562 to encourage the Federal government to get its act together with regard to Arctic science. This morning, I believe we will learn a little about what the Federal government has been doing wrong in the Arctic—or what it needs to do in the critical years ahead. In a few weeks, we will take what we will learn here today to a similar hearing to be held in Washington, where we will have a change to discuss research needs, priorities, and policy with the Federal agencies charged with conducting Arctic research.

This morning we will hear from a few Alaskans with the most to say about Arctic science and the need for a comprehensive Federal policy. There are a great many others here who would have spoken if we had enough time to accommodate them. To those of you here this morning, let me encourage you to submit written testimony. We will keep the record open for several weeks, and I can assure you that your testimony will be read and it will be useful to us.

While I have this distinguished group all together at one place, I would like to make some general observations about the Federal government's role in Arctic science. First, we are all aware of the budget constraints facing Congress. obviously, I don't believe we will see Federal money coming to the Arctic to perform scientific research unrelated to pressing, national needs. I would encourage the State of Alaska to continue to develop its own research policies to pursue the types of research that the State should be responsible for. The Federal government isn't going to do it for us—the money just isn't there.

Second, I want to say something about the Arctic research that is currently being undertaken by the private sector. While the Federal government lacks a coordinated approach toward Arctic research, the private sector appears to be doing an excellent job in undertaking a great deal of the research necessary for rsource development in the Arctic. While there is room for the Federal government to complement the research undertaken by the private sector, I do not want S. 1563 to be construed as a means to allow Federal research to undercut or become a substitute for the fine research being undertaken by the private sector. Rather, I believe the Federal government should become a partner with the private sector, the State of Alaska, and the residents of the Arctic in the effort to increase our knowledge of the region.

Finally, I want to stress the fact that the range of issues and needs that could be touched by a comprehensive national policy go beyond the well-recognized need to minimize adverse impacts assoicated with resource development. We must not lose sight of the other benefits that will accompany a coordinated national Arctic science policy. For instance, we can know more, and indeed we must know more about Arctic phenomena which affects the health of rersidents in the Arctic and sub-Arctic. We know that there are surprisingly high amounts of industrial pollutants in the Arctic that can have unhealthful effects. We know that there are surprising amounts of asbestos—a known carcinogen—that exist in some of the rivers and streams of the Arctic and sub-Arctic. We need to know more about its effects. Finally, just as the Arctic residents have a high incidence of disease less commong in much of the lower-48, some health problems common in the lower-48 are virtually non-existent amog Arctic residents.

My point is simple: If we invest now to increase our basic understanding of the Arctic, the future payoffs will come in ways that we cannot even anticipate today. Arctic study mightr provide answers that will help us cure a diosease, find new resources, protect a fragile local environment, or avoid a climatological disaster on a global scale. This morning—on this very campus—scientists and weather experts are meeting to discuss the impacts of the increase in atmospheric carbon dioxide on Arctic and global weather patterns. This is but one example, and as we all know, the list goes on and on. Whether we are talking aobut protecting the environment, finding new resources, curing disease, enhancing our defense capability in the Arctic regions, or understanding the effects of polar phenomena on global weahter patters, one thing is clear: we simply cannot approach scientific research in the Arctic as we have in the past. We need to plan more, accomplish more, and understand more. That is the basic purpose behind S.1562, and I will look for the continued guidance and support of those of you here today to help achieve that goal. I look forward to your testimony.

Thank you, Mr. Chairman.

Senator STEVENS. Thank you, Frank. I want to state that we have a series of papers that have been prepared by the Office of Technology Assessment. I'm the chairman now of the Technology Assessment Board for the Congress, and Dr. Gibbons, who is the director of that Office of Technology Assessment has had the staff prepare a series of discussion papers on possible research needs for the Arctic and subarctic region. Dr. Bill Davis, formerly of Alaska Methodist University, who's a member of the Office of Technology Assessment staff, is here with us to monitor these hearings for the Office of Technology Assessment.

Our first witness, as I stated, is Mayor Burnett. Would you do us the honor, and proceed, please?

TESTIMONY OF RUTH BURNETT, MAYOR, FAIRBANKS, ALASKA

Ms. BURNETT. Good morning, Senator Stevens and Senator Murkowski. Thank you for inviting us to testify before you on this very important matter. I welcome the chance to support the proposed Arctic science concept. Although the bill presently may not be in acceptable form to all parties who would be affected by it, the need for a comprehensive coordinated program that utilizes the skills and resources of the public and private sector, as well as the expertise of the academic community, is nonetheless imminent. A bill purporting to accomplish what S. 1562 attempts would significantly affect the interior of Alaska, the area which I intend to concentrate on in this testimony. An improved understanding of the Arctic, its weather cycles, and its adaptation of vegetation to thrive in the rigors of northern Alaska, would enhance the development of economically viable agricultural projects in the State. In addition, increased knowledge of the fragile Alaskan soil, erosion problems, and permafrost would assist the future development of agriculture in the State, in particular, and ultimately, in the rest of the country. As more and more of the State's mineral resources are recovered, the need will arise for additional railroad and road transportation systems. The more we are able to learn about the affect of road and rail construction on the Arctic environment the better we will be able to minimize the potential impact on Arctic wildlife and the permafrost. There are vast quantities of coal and peat .that could be used for fuel presently trapped in permafrost that may become economically feasible to develop if the technology to mine them efficiently and safely becomes available. The releasing of these resources would provide jobs for Alaskans, and energy for both the State and the Nation. These resources, when recoverable, would be followed by the construction of synthetic fuel or gassification plants to enable the transformation of these energy sources to a form more readily transported to the continental United States.

With the inevitable future development of the interior and with the development of the energy wealth of Alaska, more Americans will become aware of the benefits of living in Alaska, and maintenance of our air and water quality will mandate a better understanding of the Arctic environment. Another applied use is that information coming from implementation of an Arctic research science policy would be improved methods of building on permafrost. Presently every building in areas with a high incident of permafrost takes the risk of melting the frozen ground below, if there is insufficient insulation between the buildings and the permafrost. This can result in the ground subsiding and the consequent shifting and settling of the building; in some instances, damage beyond repair.

These problems and surely many others that I have failed to mention today, might be solved or perhaps partially alleviated with the introduction of an effective Arctic science policy. The need for a comprehensive cooperative effort to understand the Arctic regions of Alaska would clearly assist the growth and development of interior Alaska. Such a policy would break the current reaction-type attitude that seems to typify present approaches to problem-solving in the Arctic. Thank you.

Senator STEVENS. Thank you very much. Do you have any questions, Frank?

Senator MURKOWSKI. I just wondered, mayor, if you had any observations on areas in the bill in which you see some difficulty that we could give some attention to.

Ms. BURNETT. No, sir, I don't at this time. I see more of a long-term benefit of the policy for the future, and I don't at this time have any comments on the actual bill.

Senator MURKOWSKI. I have no further questions.

Senator STEVENS. Has the city encountered any research problems that it's tried to have done by some entity that might affect its operations? Have you run into any difficulties that you would like to have assistance on?

Ms. **Burnett**. No, sir, but I think that it's very evident that the lack of sufficient information has caused us problems in construction, and environmental damage. I think that's pretty evident. Over the long term, we've seen this type of damage. And I think the more information that's readily available to contractors and potential developers, the better off we're going to be.

Senator **Stevens**. What about your relationships with the military? Have you had any questions raised from the military sector about Arctic conditions, or how the conditions might affect their operations? Have they sought any guidance from the city officials in your term as mayor?

Ms. **Burnett**. Not directly from the city, no, sir. There have been some problems because of lack of permits, and filing, and information as far as building ice bridges and that sort of thing, but I think again that's been in a more reactive situation. Had the information been readily available, it could have been facilitated in a more expedient manner, but I haven't had anything directly related between the city and the military.

Senator **Stevens**. Thank you very much.

Ms. **Burnett**. Thank you.

Senator **Stevens**. Our next witness is Ralph Andersen of the North Slope Borough. Good morning, Mr. Andersen.

TESTIMONY OF RALPH ANDERSEN, SPECIAL ASSISTANT TO MAYOR EUGENE BROWER, NORTH SLOPE BOROUGH

Mr. **Andersen**. Mr. Chairman, members of the committee, my name is Ralph Andersen. I'm special assistant to Mayor Eugene Brower of the North Slope Borough. I appreciate the opportunity to testify and present views of Mayor Brower and the citizens of the North Slope Borough on the Arctic Research and Policy Act of 1981. Mr. Chairman, I have a longer written statement which I'll submit and ask to be made part of the record in these proceedings. I have a shorter statement, which summarizes my testimony which I'd like to present at this time.

Senator **Stevens**. Please do. And your statement will be printed in full in the record.

Mr. **Andersen**. Thank you.

This borough comprises much of the American Arctic. We consider this legislation to be very important to a wide variety of local, national, and international interests. We are happy to see the introduction of S. 1562. This is the first real evidence that our efforts to encourage the development of a national Arctic policy might be successful. We, in the Arctic, have developed a unique culture that is heavily dependent upon the resources of our fragile yet harsh environment. We have developed a respectful relationship with our land, and with our wildlife. Our work to protect our land, and our only renewable resources began as early as 1975, when our late Mayor Eban Hopson was asked by the Committee on Regional Peoples Entitlement in Canada for his support and opposition to proposed drillship operations in the Canadian Beaufort.

The same year, Union Oil Co. began Alaska's first offshore operation. It then became very clear that the oil and gas operations in the Beaufort Sea required the strong national Arctic policy. It is essential that our oil and gas development proceed in such a manner that it does not threaten our subsistence resources and their habitats. We look to our congressional delegation and our State government to protect our most vital interests, just as our people look to the North Slope Borough to protect their interests. We are fully aware of the national need for oil and gas, and the importance of the Arctic's energy resources reducing our Nation's dependence on foreign oil. The national interest in our Arctic resources also extends to national security concerns.

The North Slope Borough, the American Arctic, share a common boundary in the Beaufort Sea with Canada. And in the west, we share the Chukchi Sea with the Soviet Union. Because of this, we may be affected by the activities of those nations. For example, an oil spill in the Canadian Beaufort will surely effect our dependence upon marine wildlife for subsistence purposes. An oil spill could mean disaster, because we feel that the industry has not developed the technology to operate safely in ice-dominated waters. Though hundreds of millions of dollars are being invested in the exploration of the Arctic offshore, and on onshore drilling operations, and a new pipeline to move natural gas to the lower 48, very little is being done in the area of Arctic research.

While millions of dollars in oil and gas are being taken out of the Arctic, very little of it is being returned. The North Slope Borough gets no oil, and no royalties from the resources of the North Slope, but it seems to get the problems that seem impossible to resolve. They are the problems that money, that the oil companies, the State and Federal Governments can't resolve. In 1977, Mayor Hopson organized and convened the first meeting of the Inuit Circumpolar Conference in Barrow, so our people in Alaska, Canada, and Greenland could speak to the need for a rational Arctic policy. Since then, the ICC has continued to work with the United States, Canadian, and Danish authorities in developing an Arctic policy.

Mayor Brower has recently returned from a trip to Canada and Greenland, where he spoke about many Arctic policy questions. He has indicated that the Canadian and Greenlandic authorities involved in the ICC support your efforts to establish and Arctic research policy. They, as we do, see this legislation as a positive step to the eventual establishment of a coherent Arctic policy.

The North Slope Borough strongly endorses S. 1562 as a measure whose time has come. We applaud the efforts of Senators Murkowski, Stevens, and Jackson for introducing this bill, and holding these hearings so the debate on this important issue can be resolved. These hearings are held just a few days after the final draft of the Alaskan National Interest Lands Conservation Act, Section 1007, study was done. We regard S. 1562 to relate closely with the 1007 study. Our view is that the study focused too narrowly on the future of NARL. We'd have liked to see NARL's future determined in the context of our national Arctic research policy requirements. Instead, the 1007 report appears to subordinate the Arctic policy question to the NARL problem. S. 1562 is less narrowly focused on

NARL, and begins to address the broader question of Arctic research policy development.

However, there are several areas where the bill can be improved. We'd like to see more local participation in the work of the Arctic Research Council. We feel that local participation on an advisory committee is no longer adequate. There must be more local involvement because this is our homeland. We will still be here in the Arctic long after the oil and gas resources are gone, and the drilling rigs and pipelines are abandoned. In addition, the reason for the success of the NPRA legislation might have been the borough's involvement in the development of recommendations to improve the bill.

S. 1562 could be strengthened by requiring North Slope Borough participation in the work of the Arctic Policy Council. While we support the establishment of the Arctic research fund, we are concerned that Federal OCS lease receipts may not yield the funds necessary for adequate and sustained Arctic research. Perhaps some way can be found to enable the industry to become financially involved. This could be accomplished by earning tax credits for money contributed to the fund, just as current industrial research is subsidized by tax-deductible dollars.

We'd also like to see S. 1562 amended to include language recognizing the need for a broad international Arctic policy. This policy could include issues such as Native land claims, Arctic tanker operations, oilspill prevention and cleanup standards, wildlife habitat protection, Native hunting rights, and other issues. These issues, though, must first be addressed by Arctic scientists from every discipline, and from each circumpolar nation. Science must provide policymakers with staffs necessary to achieve a balance. Developing a national Arctic research policy is a good beginning for a national Arctic policy. We'd like to see S. 1562 amended to include or acknowledge the Inuit Circumpolar Conference, and provide for its participation in the work of the Arctic Research Council.

Finally, we believe the interests of the United States, as well as the people of the North Slope, call for facilities to support Arctic research. We suggest the Naval Arctic Research Laboratory provides the ideal location. We find it very difficult to understand why the Federal Government is phasing out operations at the NARL when it is the only facility for Arctic research in the whole United States. We feel strongly that NARL can serve as an international hub for Arctic research. It only makes sense that an existing facility be used rather than investing millions of dollars to create a new one. Once again, I thank you for the opportunity to testify before this committee, and I'll answer any questions you might have.

Senator STEVENS. Frank, do you have any questions?

Senator MURKOWSKI. Mr. Andersen, what impact will this proposed legislation have on your local government, as you see it?

Mr. ANDERSEN. Well, because the North Slope Borough comprises much of the American Arctic, I think it will have a great impact on the Borough. For years, since 1975 specifically, we of the North Slope Borough, under the leadersip of Mayor Hopson have been pushing toward the establishment of a comprehensive Arctic policy, and we feel that the Arctic research policy is a good step toward the eventual establishment of such a policy. I feel it will have a great impact on our local government.

Senator **Murkowski**. You've indicated your concern with the bill in a number of areas which are going to be very helpful to us. You've indicated you felt there should be more local particpation. And we certainly note that. I'm wondering though if you have any specific recommendations on what role you see Alaska's Native community, Alaska's Arctic Native community, playing in this developing Arctic research.

Mr. **Andersen**. Well, I think that the Alaska Native community will play a very important role.

Senator **Murkowski**. Are there any specifics that you might refer to for the record that would just give us some parameters that you feel would be appropriate for the interests of Alaska's Native community?

Mr. **Andersen**. I'd like to see the Native community involved in—not actually on the research council—but involved in some of the work in developing the policies that the research council adopts. There are a lot of local people who don't have college degrees who understand ice conditions, who understand how the water moves, how the ice moves, or the times of year when game is prevalent, and when game is scarce. They know the types of activities that impact the environment and the wildlife. And those are the areas in which I think the local people can be very valuable to the Arctic research policy.

Senator **Murkowski**. As you know, in addition to the policymaking group in the bill there's an advisory group as well, where I think local participation could be very intrumental. The recommendations of the local people who have the local knowledge on the advisory board, would be transmitted to the policymaking group. The policy group is composed of the department secretaries, and of course the Governor. I have no further questions.

Senator **Stevens**. Well, we all know Eban Hopson's background as a member of the legislature, and then as a representative of the North Slope, and his activities in the Canadian Arctic movement. Let me ask you this: do you have any knowledge of any issue that either he or the current mayor, Mr. Brower, sought assistance on as far as Arctic research is concerned that they're unable to obtain assistance on?

Mr. **Andersen**. Currently, the North Slope Borough has an agreement with the National Marine Fisheries. This year we'll be conducting a census of the bowhead whale. It's not an example of where we have not been able to get any assistance, but it's an example of the type of research that we would like to see this bill address.

Senator **Stevens**. Well, we're familiar with that in terms of the contract that was arranged with the National Marine Fisheries Service. But what I'm interested in is whether there have been any discussions to your knowledge in the local government, of areas where our research base is deficient; where we have sought assistance and have not been able to obtain it so far. Have there been any such discussions, to your knowledge?

Mr. **Andersen**. No, not that I know of.

Senator **Stevens**. I don't have any further questions.

Thank you very much. Appreciate your courtesy.

[The prepared statement of Mayor Eugene Brower follows:]

NORTH SLOPE BOROUGH
OFFICE OF THE MAYOR
P.O. Box 69
Barrow, Alaska 99723
Phone: 907-852-2611

Eugene Brower, Mayor

April 5, 1982

The Honorable Frank Murkowski
Senator for Alaska
United States Senate
15B Russell Office Building
Washington, D.C. 20510

Dear Senator Murkowski:

The following are comments for the North Slope Borough on the Arctic Research and Policy Act of 1981.

With respect to the traditional and local interests involved, the Eskimos who reside in the Arctic have developed a unique culture that is totally dependent upon the resources of the fragile Arctic ecosystem. We are proud of our language and our history. We are proud of our culture traditions. We are dependent upon our relationship with the land and the subsistence resources the land and the waters of the Arctic provide us.

We are concerned that, as industrialization and resource development take place on the State, Federal and private lands in the Arctic, such activities be properly planned and proceed only after adequate consultations with our Congressional delegation, our Governor, our local government, and our people. We are concerned that all developmental activities proceed in a manner which properly protects the land on which we depend and the resources on which we subsist.

This is difficult task. Our people are scattered in eight villages over an area the size of the state of Montana. Our people face tremendous cultural, environmental, social and technological changes. Most of these changes are both propelled by and associated with Arctic energy development. Our people look to the Borough-- and to me as Mayor-- to protect their interests. The Borough looks to our Congressional delegation and to our State government to protect our most vital interests.

We are, of course fully aware of the strategic importance of the Arctic to the national interest. Development of the Arctic's energy resources can significantly reduce our nation's dependence on insecure and costly sources of foreign oil.

On December 3, 1981, the National Petroleum Council released a report on U.S. Arctic Oil and Gas. The report concluded that potentially recoverable undiscovered oil and gas reserves in the United States Arctic are estimated at a total of 44 billion barrels of oil and oil-equivalent gas, with a 1 percent probability that the reserves could exceed 99 billion barrels. In addition, a recent discovery of heavy oil in the zone above the Kuparuk area indicates that the zone contains about 18 to 40 billion barrels of heavy oil. The development of this resource will depend on State and Federal tax policy. It will also depend, in an important respect, on the policies of the North Slope Borough. The policies of the Borough will, in my view, depend on how the Federal government and the oil industry approach the problem of Arctic Research Policy.

The national interest in S. 1562 also extends to national security concerns. The proximity of the Alaskan Arctic to the Soviet Union, in addition to the fact that we represent the only common border with the Soviet Union, becomes even more significant as the nation's dependence on Arctic energy resources increases. We also share a common border with Canada.

On an international level, the people of the North Slope are concerned that our Arctic neighbors, specifically the Soviet Union, Canada, and Denmark, have recognized the need for active and expanding Arctic research programs while this country is still involved in the opening rounds of a debate as to whether or not a comprehensive and coordinated Arctic research policy is needed in the first place.

We find it very difficult to understand why the Federal government has been phasing out operations at the Naval Arctic Research Laboratory at Barrow, which is the only Federal facility for Arctic research now available in the United States. At the same time, the Administration is expending the nation's interest and level of commitment to research in the Antarctic--an area where no resource exploration is taking place, and an area with no indigenous United States population.

The National Science Foundation budget is indicative of this disparity. I understand that NSF has budgeted $70 million for Antarctic research and a mere $70,000 for Arctic research.

While hundreds of millions of dollars are being invested in exploration of the Arctic, in offshore and onshore drilling rigs, and a major new pipeline facilty to move gas to consumers in the lower 48 states, very little is being done in the area of Arctic research.

The national government is taking many millions of dollars out of Alaska and the Arctic. Over the next 20 years they will take hundreds of millions of dollars while returning very little. Our environment, our subsistence animals and even our Culture are threatened by this head long rush to develop the Arctic's energy resources.

The North Slope Borough gets no oil and no royalties from the resources of the North Slope.

We were permitted to select our lands-- under the Alaska Native Claims Settlement Act-- from the leavings-- after NPRA was created in 1923; after the Arctic Wildlife Refuge was created in 1960; after Prudhoe Bay was selected by the State and leased out; and, finally, we have received nothing, absolutely nothing, from the State lease sales on State lands, on State tide lands or on the Federal OCS.

But we-- the leaders in the Slope's governmental bodies-- we get the insoluable problems; the problems that money, that oil companies, that the Federal government, and that the State government can't resolve.

The North Slope Borough began making an effort to convince the Federal government to develop a national Arctic policy in 1975, when Union Oil began Alaska's Arctic offshore exploration program on offshore tracts included in early Prudhoe Bay lease sales. Our efforts led us to organize the Inuit Circumpolar Conference. This organization has since joined with the North Slope Borough in seeking a coherent national Arctic policy, and is available for consultation on the issue of Arctic research and policy.

The North Slope Borough strongly endorses S. 1562 as a measure whose time has come. We applaud your efforts and those of Senators Stevens and Jackson for introducing the bill. We thank you and Senator Stevens for holding these hearings so that debate on this issue can be joined and, hopefully, be resolved. You only have to review the list of major energy projects that are planned or proposed for Alaska over the next decade to be convinced, as we are, that the time for a comprehensive and coherent Arctic research policy is long overdue. Such a list includes, but is not limited to:

-- the Alaska Natural Gas Transportation System that will carry Prudhoe Bay gas to the lower 48 states;

-- the 23 million acre National Petroleum Reserve-Alaska that was opened to private leasing for the first time this year;

-- offshore oil and gas development in the Beaufort and Chukchi Seas of the Arctic Ocean;

-- preliminary investigation of the oil and gas potential of the Arctic National Wildlife Refuge authorized by the Alaska National Interest Lands Conservation Act;

-- development of Arctic coal reserves;

-- development of icebreaking tankers to move oil from offshore areas to the United States;

-- proposals for a petrochemical industry to use Prudhoe Bay natural gas liquids; and

-- private exploration on State-and Native-owned land on the North Slope.

Much of the exploration and development involved in these projects will be undertaken in remote and fragile areas in which totally untested new technologies will have to be employed. The consequences of these technologies are not yet known. The Borough would like to see scientific research efforts catch up to and overtake these development plans so oil spills, noise, Arctic tanker movement, impacts on marine mammals, and many others -- can be foreseen, addressed and resolved before irreparable harm is done to our land, our water, and our subsistence resources.

Today, private industry says all necessary research has been completed or is underway. We seldom see the results of the private research. The research efforts of Federal agencies are hampered by a serious lack of funding and by a serious lack of focus on the Arctic. State agencies are willing to participate, but they do not want to be left with all of the cost and all of the responsibility as a prt of the new Federalism.

The net result, however, is that everyone agrees that more must be done. But no one -- neither the oil industry, the Federal agencies, nor the State government -- is willing to fund and administer what is agreed to be a critically needed effort.

Should we -- the North Slope Borough -- fund this research effort? Is it our responsibility to fund the basic and applied research to determine whether the 240 million citizens of the United States should or can proceed all out to try to develop the resources located on our land and beneath our waters?

We are only 4000 Eskimos. We live in eight Villages scattered across a huge land area. We are trying to come to terms with concepts of "ownership" of the land, individual share holders of "stock" in Native corporations, annual meetings, inheritence, and other alien concepts. We cannot be expected to undertake the efforts necessary to ensure adequate scientific research in the Arctic without substantial assistance from the Federal and State governments.

The North Slope Borough should be directly involved in determining how Arctic research should be focused. Let me list a few principles that should guide research and then some very specific concerns. The guiding principles should include at least the following 4 items:

1. There must be more involvement of the Native community since my people will still be here when the oil and gas resources are gone and the drilling rigs and pipelines are abandoned.

2. There must be an identification of those resource developmental activities which adversely impact Native people and/or subsistence use animals.
3. There must be a major effort to minimize the adverse affects associated with resource development.
4. There must be a sound program for the long term assessment of environmental changes associated with resource development.

We have numerous very specific concerns as you might imagine. Many of our specific concerns relate to our subsistence use animals particularly the bowhead whale, caribou and fish. Since our very Culture is so closely tied to the bowhead whale, we feel that any threat to the bowhead is a threat to our Cultural survival. We must learn much more about those geographic areas that are critical to the survival of our subsistence animals and such areas must be protected. In addition we have specific concerns about the physical appearance of the landscape especially regarding clean up after abandonment of DEW line sites, NARL, drilling sites and the other numerous industrial sites on the North Slope.

We are aware that a modest amount of research on impacts of development in the Arctic is currently under way. However, we are concerned that the efforts on the Federal, state, local and private levels are fragmented and lack overall coordination. We support the establishment of an administrative group such as the proposed Arctic Research Council to coordinate a comprehensive Arctic research policy. We also feel that it is essential that the Native Community and the State of Alaska be represented in such an administrative group. Such a coordinating council can also assist in prioritizing new research efforts to assure that existing funds are spent as wisely and as expeditiously as possible. We also commend the Senators on proposing a method of funding other than the traditional Federal appropriations process.

While the Borough recognizes the natinal and international need for a coordinated Arctic research policy, we must stress to this committee the importance of providing a mechanism for continuing input from the residents of the North Slope. We believe that the Native population is in the best position to assess what is reasonable in terms of impact from development, and that the years of Arctic experience, the views, and the priorities of our people must be major considerations in the establishment and administration of priorities for an Arctic research policy.

The Borough also believes that the interests of the United States in the Arctic, as well as the interests of the people of the North Slope, call for the establishment of a significant facility to support research in the Arctic, at lease comparable to that of the United States' Antarctic Research Program. In this regard, I would suggest that the Naval Arctic Research Laboratory provides the ideal location.

A nation of the stature of the United States needs to project a strong image within the Arctic. This image should include much more than just a desire to exploit the Arctic's natural resources. For many years the NARL has served as a science focal point for the U.S. Nearly all of the U.S. scientists which have worked in the Arctic have utilize this laboratory. It goes without question that a sound logistical base is necessary for research in the Arctic. That logistical base already exists. Why not restore it as an active National Arctic Research Laboratory?

What is the cost of maintaining a National Arctic Research Laboratory? We estimate the cost at $10 to 12 million annually. At $30 per barrel this represents approximately ½ of one day's production at Prudhoe Bay. The cost of maintaining such a laboratory is less than the cost of one exploratory Arctic well. It is a tiny fraction of the revenues the Federal government receives from bonus bid sales.

What are the benefits of reactivating NARL as the National Arctic Research Laboratory? There would be many benefits, but some of the more obvious ones will be the following:

1. This National Arctic Research Laboratory will serve as a logistical support base for visiting and (hopefully) resident scientists. This function seems basic to the implementing of any Arctic research policy.

2. This Laboratory should serve as the base of operations for a major effort directed to assessing environmental change associated with Arctic resource development.

3. This Laboratory could serve as an information center for Arctic science and engineering.

4. This Laboratory could serve as an information resource for Native people of the U.S. Arctic.

In summary, the North Slope Borough supports S.1562. The people of the North Slope will be on the North Slope long after our energy resources have been extracted. We must have a coordinated and comprehensive national arctic research policy. This policy must incorporate active Native participation to ensure that resource development does not jeopardize the other natural resources on which we have subsisted for centuries and on which we will continue to depend long after the wells run dry.

Thank you for the opportunity to comment on this important legislation.

Sincerely,

Eugene Brower, Mayor
North Slope Borough

Senator **Stevens**. All right, we now have Oliver Leavitt, representing the Arctic Slope Regional Corp. Is there a representative here from the AVCP?

Senator **Stevens**. Good morning, Oliver.

Mr. **Leavitt**. Good morning Senator.

Senator **Murkowski**. Good morning, Oliver. How are you?

Senator **Stevens**. We had a meeting yesterday afternoon in Anchorage with the AVCP people, and they told us they had been requested to attend another meeting today, and may not be here. There's a conflicting meeting that they felt was very essential from the point of view of their region that they had to attend. But we did meet with them yesterday afternoon in Anchorage. We're happy to have you here this morning. Do you have a statement?

Mr. **Leavitt**. Yes, I do, Senator. I'm sorry I can't answer for the AVCP.

Senator **Stevens**. No, they told us yesterday they might not be here. If that meeting was what they thought it was going to be, they just felt they all had to stay in Anchorage.

TESTIMONY OF OLIVER LEAVITT, REPRESENTING THE ARCTIC SLOPE REGIONAL CORP.

Mr. **Leavitt**. Thank you, Senator. Mr. Chairman, members of the committee, my name is Oliver Leavitt, and I'm appearing before you as a representative of the Arctic Slope Regional Corp. ASRC appreciates the opportunity to offer its views on S. 1562, the Arctic Research and Policy Act of 1981. ASRC is one of the 12 regional, corporations established pursuant to the provisions of the Alaska Native Claims Settlement Act of 1971. ASRC shareholders are 4,000 Native people of the North Slope. Since the establishment of ASRC, it has undertaken numerous activities intended to benefit the people of the North Slope.

Under the claims act, ASRC has selected and received conveyance to more than 5 million acres of land on the North Slope. Much of this land was selected for its resource potential. And ASRC has taken steps to explore and develop this potential. In addition, ASRC has established several profit subsidiaries focusing primarily on activities of the North Slope. Many of these subsidiaries provide services to other developmental activities on the North Slope. In the past decade, ASRC has been deeply involved in almost all of the research development activities of the North Slope. In contrast to all other resource developers operating in the Arctic, however, we are in a unique position. Our people have lived in the Arctic thousands of years. We have lived almost exclusively off the land and the sea, and the resources that they provide. Only through our understanding of the Arctic environment, knowledge passed on from generation to generation, have our people survived. Today, and for the next several decades, the Arctic will serve as the host for intense resource development activities.

Long after the developmental activities have ceased, our people will continue to live in the Arctic, and hopefully have the opportunity to continue our traditional way of culture. Therefore, we are extremely sensitive to the concern that all developmental and industrial activities that occur in the Arctic take place in a manner that protects the natural resources, which will continue to exist after the mineral resource has been removed.

We view the passage of S. 1562 as critical to the realization of our goal of development of the Arctic's substantial resources in the manner that preserves the fragile ecosystem of our home. Only by the establishment of a comprehensive, coordinated national Arctic research policy can the American people, and more particularly, the residents of the Arctic Slope, be assured that development will occur in a responsible manner after the completion of adequate research to insure that these developmental activities do not have severe impacts on the Arctic environment. The Arctic is believed to contain vast stores of energy resources; in particular, crude oil and natural gas.

In the past decade, the Nation has realized its vulnerability to unstable foreign petroleum supplies. That vulnerability could be significantly reduced by development of the Arctic's vast energy resources. As a result, much developmental pressure has been brought to bear in the Arctic. However, in developing the resources in the Arctic, the Nation has both a legal and moral obligation to the residents of the Arctic to assure that exploitation of our resources does not jeopardize the subsistence resources on which our nutritional and cultural needs depend. The development and implementation of coherent and comprehensive Arctic research policy is long overdue.

Developers of the Arctic confront unique environmental conditions. Accepted practices and technologies that work in the lower 48 may or may not work in the Arctic. It is important that methods be tested before they are employed on a larger scale, or irreparable damage may occur. The enactment of S. 1562 will insure that the necessary short-term and long-term research is conducted, so that the inevitable developmental activities in the Arctic may be accomplished with minimum impact in the Arctic environment and its residents. In contrast to the low standard that the Federal Government has accorded to their Arctic research policy is ironic in that the Federal Government has consistently accorded substantial attention to research in the Antarctic. The Federal Government has given a higher priority to research in the Antarctic, a barren wasteland with little present resource value and no indigenous population, than it has given to research in the Arctic, where there is substantial research development activity, and which is the home of many thousands of American citizens. This attitude is clearly reflected by the Government's decision to close down the Naval Arctic Research Laboratory, the only laboratory in the Arctic devoted to Arctic research.

At the same time, we in the Arctic understand that the Government has committed many millions of dollars for Antarctic research in the budget of the National Science Foundation. As residents of the Arctic, we resent this distorted sense of priority. We applaud the efforts of Senator Murkowski, Senator Stevens, and Senator Jackson, in proposing S. 1562, in an attempt at long last to establish a national Arctic research policy.

We specifically support the funding mechanism in this bill as the best method to insure that Arctic research policy is actively pursued without running into Federal budgetary constraints. Considering the amount of money that the Federal Government, the State of Alaska, and research development companies, will earn as a result of exploitation of the Arctic, ASRC believes that the funding mechanism contained in S. 1562 is more than reasonable.

As residents of the American Arctic, as Native people concerned about the preservation of our culture, and our heritage, and as responsible members of the Alaska corporate community, we'll do all we can to cooperate in an effort to establish a coordinated comprehensive national Arctic research policy, a program that will insure that the Arctic is developed in an intelligent manner sensitive to the fragile nature of the Arctic environment. Only through the cooperative efforts of the Federal Government, the State of Alaska, the scientific community, private industry, and local residents of the Arctic, may these goals be achieved.

In this regard, I would like to underscore the points raised by the mayor's assistant of the North Slope Borough, in his testimony before the committee today, with respect to active Native involvement in development of any Arctic research policy. As long-term local residents in the Arctic, we have the requisite knowledge of the Arctic environment, and we have an interest in insuring its protection. Without our input, a workable Arctic policy cannot be developed.

Once again, I thank you for the opportunity to appear before this committee, and I'm prepared to answer any questions you may have.

Senator STEVENS. Thank you very much.

Senator Murkowski, do you have questions?

Senator MURKOWSKI. Yes, Mr. Leavitt. Your experience with your Arctic Slope Regional Corp., in development activities associated with the Arctic puts you in a rather unique position. From the standpoint of the technology that's necesssary for development in the Arctic, I recognize that there is concern for the environment and the ecology and the people. What are the most common problems of the Arctic rim countries with regard to technological considerations?

Mr. LEAVITT. Probably spring breakup. [Laughter.]

Senator MURKOWSKI. That's a good answer, it's one word. But I'll ask a longer question then. [Laughter.]

Being experienced in the world of development, as your corporate record illustrates, please consider the following. What we have here is a blending of a number of organizations. We have the Secretary of Interior, who's going to be the chairman of the Arctic Research Council. We have the Secretarys of Defense and Commerce, and the Governor of the State of Alaska.

In addition, in an advisory capacity, we have the scientific community of the country including Alaska's scientific community, the University of Alaska, the State of Alaska, and of course, the Native communities themselves. In your opinion, is that group potentially unwieldy? Can agreements be reached? How can we harmonize the group to make it flow functionally, so that we don't have a situation where a stalemate results?

Mr. LEAVITT. Well, Senator, we welcome the thought of these committees for the first time focusing their attention on a policy for the far Arctic. This has never really been done before. The Arctic Research Laboratory was like a hotel for different universities that did their individual studies and took them home. But we welcome the thought of the Secretary of the Interior being the chairman. And we've never had a budget per se for doing something together and discovering what goes on in the Arctic, in this fragile environment. We'd love to know a lot of the things that they found out years ago. And we welcome the thought of your doing this, and we really appreciate your putting this bill together so that we may have some knowledge to deal with the Arctic.

Senator MURKOWSKI. What would be the No. 1 priority for research from the standpoint of your regional corporation?

Mr. LEAVITT. Ice dynamics.

Senator MURKOWSKI. Ice dynamics.

Thank you. I have no further questions.

Senator STEVENS. Have you made requests of the laboratory of NARL in the past for assistance through your corporation?

Mr. LEAVITT. We've really not, Senator, because although we've always been good friends, a lot of the stuff they kept was, say, kept close to the chest of the scientific community. And for some reason, information is not disseminated towards the community itself.

Senator STEVENS. Well, they did some studies on earth movement in the Arctic, and some studies on ice scouring. Were your people involved in those at all, do you know?

Mr. LEAVITT. No, we were not.

Senator STEVENS. If we develop an Arctic policy, as Senator Murkowski's bill suggests, do you have any time frome for implementing such a policy? Do you see us looking for a goal of developing a policy in 2 years, 5 years, 20 years? What kind of timeframe do you see for an Arctic policy?

Mr. LEAVITT. Well, off the top of my head, I would say at least 5 or 10 years. I don't think we can do it in 2 years.

Senator STEVENS. Is it a long range problem of dealing with the research base there, and then formulating policies based on that research, in your opinion?

Mr. LEAVITT. Well, I'm no scientist, as you may well be aware.

Senator STEVENS. I'm wondering, though, about the problems that you face in your corporation. You've got these lands now, you've got massive operations that are commencing, and I wonder whether you, as managers of that large corporation have encountered an basic problems?

Mr. LEAVITT. Senator, every time they introduce an ordinance problems develop. For example, take the coastal zone management, where they say you can't develop your land because it's flood plains. Yes sir, we do encounter some problems.

Senator STEVENS. Thank you very much.

Senator MURKOWSKI. I have one more question, if I may.

You indicated ice dynamics to be your top priority. I have a general understanding of what I think that means, but I'm not a scientist either. Could you elaborate a little bit? I assume you mean the effect of ice on established structures, whether it be platforms, or ice islands or manmade islands of some sort. Could you just elaborate a little more for the record? Some of the people back in Washington may take a different interpretation of ice dynamics than you may intend.

Mr. LEAVITT. Well, whether they're platforms or manmade islands, I would like to see what effect they would have in deep water.

Senator MURKOWSKI. Beyond the barrier islands, for example?

Mr. LEAVITT. Yes, beyond the barrier islands. When that ice starts moving, there's really nothing that you can do except pray. You can make all the laws that you want in Congress, but unless you have the hot line to the Lord, you're not going to stop it. And I would like to see one of those environment-type things of an ice island or a manmade island, and see what would happen in not just 2 years, but let's say 5 years.

Senator MURKOWSKI. Do you have any knowledge that the Soviet Union may have done some experiments in the Soviet Arctic?

Mr. LEAVITT. I really have no idea.

Senator MURKOWSKI. Maybe we'll ask the scientific community when they testify. Thank you. I appreciate your testimony, Oliver.

Mr. LEAVITT. Thank you, Senator.

Senator STEVENS. Thank you, Oliver.

We now have the scientific academic panel of Max Brewer, former director of NARL, Juan Reoderer of the University of Alaska, Dave Hickok of the Alaska Council on Science and Technology, and Vera Alexander of the Institute of Marine Sciences, of the University of Alaska.

Good morning. We appreciate your willingness to paricipate in the hearing, to establish this record for us. Let's proceed with you first, Max, how's that?

TESTIMONY OF MAX BREWER, FORMER DIRECTOR, NAVAL ARCTIC RESEARCH LABORATORY; JUAN G. ROEDERER, DIRECTOR, GEOPHYSICAL INSTITUTE, UNIVERSITY OF ALASKA; DAVE HICKOK, ALASKA COUNCIL ON SCIENCE AND TECHNOLOGY; AND VERA ALEXANDER, INSTITUTE OF MARINE SCIENCE, UNIVERSITY OF ALASKA

Mr. **Brewer**. Very fine. I thank you, Senator Stevens and Senator Murkowski, for giving me the opportunity to discuss a subject that is very dear to may heart. My name is Max Brewer, and I'm appearing before the committee as a former director of the Naval Arctic Research Laboratory at Barrow. I headed the U.S. Geological Survey's Arctic ice and permafrost project at Barrow from 1950 until 1956, when I was appointed director of the NARL. I remained at Bararow in that capacity for 15 years, leaving in July, 1971, to become Alaska's first commissioner of Environmental Conservation. I concur and wholeheartedly support the findings and purpose stated in S. 1562.

The United States has great economic interests in the Alaskan Arctic, and numerous responsibilities in many areas of the Arctic. In order to protect these interests, and fulfill the numerous responsibilities, the Nation and its agencies must learn to know the Arctic, to become familiar with its environment, to understand its people, and to learn how to operate and live there in a more efficient and far more economical fashion than we do today. We, as a Nation, can no longer afford to make ad hoc decisions based on too little information about the Arctic lands and seas, and their inhabitants, or to continue to think that just by adding more money, we can efficiently and effectively operate there.

Thus there is a great need for an official commitment by the Congress to support research in the Arctic on a continuing basis. While I favor the concept of a council as referred to in section 3(a) of the bill, or a commission, if possible I would recommend that it be an independent commission under the executive branch. The three secretaries proposed for the council are busy individuals with many responsibilities, and thus would need to depend on other unnamed individuals to do much of the proposed council's work. Some tender loving care by a few dedicated people with access to be heard, is needed for a research program to be either economical or successful in the Arctic, and to keep it from being swallowed up by the bureaucracy.

Other areas in the bill that give me pause are: One, section 3(a). The legislated invitation enabling the Administrator of the National Oceanic and Atmospheric Administration, the Director of Smithsonian Institution, and the Director of the National Science Foundation to attend council meetings, appears to be a disinvitation for attendance by other agency heads, several of whom should have the responsibility for far more operations in the Arctic than those named.

Two, section 4, 5(b). The requirement for each user to pay all costs reasonably associated with its use of the NARL facilities, was the basic cause for the decline in the amount, and to some extent, the productivity of research eminating from the NARL during the past several years. If good, particularly long-range research in the Arctic is going to be accomplished, it will need some degree of Federal subsidy.

It has been proven at the NARL that the most economical way of providing that subsidy is through providing logistical support free of charge to all governmentally supported users, and at a nominal cost to industry users. That approach eliminates the requirement to employ a bevy of bookkeepers, to keep track of numerous small charges, reduces the tendency for each agency to mount its own Arctic expedition, since no agency wants another agency to spend any of its money—for each agency to buy its own equipment, supplies and cold weather gear, and to furnish its own transportation.

In many instances, economies can be obtained by several succeeding programs, reusing common items of equipment purchased for an entire new project. This method of support also provides a subtle mechanism in the coordination of Arctic research, since the research dollar will have a tendency to go to those proposals which have received authorizaton for logistical support. The work in the 1960's at the NARL was handled in that fashion.

Item 3, sections 4-7, mentions coordination, after consultation with the Secretary of State, and in conjunction with his offices, of exchanges of information about the Arctic on an international basis. This type of requirement has stymied numerous attempts by agencies to promote an Arctic science policy for the past quarter of a century. It is recommended that this paragraph be omitted, that the United States adopt a program of supporting research in the Arctic, and that the State Department involvement only be at that department's pleasure.

While the above suggestions and comments address the bill as written, they do not lessen our enthusiastic support for the bill, with only minor modifications. It has been a general truism for the last several decades that either the field work and research were accomplished prior to the decision concerning a major development in the Arctic, or that the development went ahead on a trial-and-error basis without benefit of field research. Thus the Canol Pipeline, the Alcan Highway, the early exploration of Naval Petroleum Reserve No. 4, and the early oil exploration in the Prudhoe Bay area, were conducted on a full speed ahead, "damn the torpedoes" basis.

By contrast, the construction of the DEW Line, the developmental phase of the Prudhoe Bay field, the construction of the Alyeska oil pipeline, and the most recent oil exploration program on the national petroleum reserve in Alaska, benefited greatly from research that had been accomplished by others in earlier years. These benefits encompassed improved construction operating practices, improved environmental protection, and substantial cost savings. Much of the information was obtained from research that had been accomplished at the NARL. While the above examples are history, it would appear that development in the U.S. area of the Arctic will continue. However, the types of basic and applied research that proved valuable to the above-mentioned programs have virtually been discontinued during the past several years. Thus the decisionmakers, the regulatory agencies, and industry in general are faced with embarking on developmental programs without the benefit of the scientific data that could be most helpful, or mounting very expensive quickie studies, which may or may not produce information having general validity. I have listed here a group of 15 studies, including many regarding ice, including pipelines coming ashore, and things like that, that are in my written testimony. For brevity, I will pass over them at this time.

A reasonably well-equipped base in which to conduct experiments and from which to operate is required to accomplish sophisticated in-depth and long-term research. The Naval Arctic Research Laboratory possesses these facilities, and in some respects has laboratory facilities superior to those found on many college campuses. In addition to the existing facilities, the NARL is well located, especially for research relating to the sea. To the northwest lies the Chukchi Sea, with one of the greatest expanses of continental shelf in the world.

To the northeast lies the Beaufort Sea with a relatively narrow continental shelf. A billiard table, flat, ocean deep, approximately 12,000 feet. A clockwise ocean current chart, and heavy polar pack ice. Two totally different environments, in both of which industry has expressed an interest.

The NARL also is centrally located for support of land-based research in Arctic Alaska. In its heyday, NARL supported research westward to the Bering Sea, eastward to the Canadian border, and beyond to Banks Island. And inland well into the Brooks Range. In providing the support of research, the NARL also constructed 10 year-round inland field stations, to operate as required for research, and established and operated over the years a total of 10 scientific stations on the Arctic icepack. Some aspects of research are amenable to quick ad hoc studies that can be accomplished in Spartan-type field camps. Few in depth research studies, especially environmental studies, fit that category.

Also, ad hoc studies seldom provide for a continuity of research where much in the way of interdisciplinary transfer of knowledge, and often are very expensive from a logistical standpoint. Good examples of these problems were encountered by the 105–C studies mandated under Public Law 94–258, Petroleum Reserve Act, 1976, and under Beaufort Sea environmental studies, which cost many millions of Federal dollars.

A further consideration in support of research in Arctic Alaska is a stable work force which has a knowledge of Arctic conditions, and an interest in research accomplishment. The community of Barrow provided much of the NARL work force, approximately two-thirds, who contributed much of the background knowledge required by field scientists for more efficient accomplishment of their tasks. One of those assistants is now the mayor of the North Slope Borough. Another is now the president of the Arctic Slope Regional Corp.

I strongly support the efforts being made by the authors of S. 1562 to provide a comprehensive national policy dealing with the national needs and objectives in the Arctic. I believe that a permanent laboratory base is required. Furthermore, I believe that the Naval Arctic Research Laboratory, renamed the National Arctic Research Laboratory, would provide a most logical permanent base in which and from which to operate. A copy of the comments concerning the draft report on U.S. Arctic research policy and the possible role for the Naval Arctic Research Laboratory is appended. Thank you.

Senator STEVENS. Thank you very much, Max. We're delighted that you've come and presented that testimony. And the things you have described, the attachments, will also be printed.

Senator STEVENS. Next, Juan Roederer, please.

Mr. ROEDERER. Mr. Chairman, Senator Murkowski. First of all, I am here representing the University of Alaska. I have been asked by President Barton to give testimony.

I have written testimony which I request be accepted for the record, which contains a little more elaboration on what I'm going to say here, and which even contains the answers to the questions you hopefully will ask. The University of Alaska recognized long ago the need for the establishment of a national Arctic research policy. Therefore, it strongly endorses the initiative taken by Senator Murkowski. As the principal institution of higher learning in Alaska, the University of Alaska specializes in the production of manpower and knowledge needed to solve the complex and highly specific scientific, technological, and social problems that are posed by the expansion of human activities into the Arctic and sub-Arctic regions.

The need for adequate means and mechanisms leading to the timely solution of these problems becomes more and more pressing as our national economy becomes increasingly dependent on the natural resources of Alaska and the adjacent waters; as our national security becomes increasingly dependent on defense systems emplaced in the Arctic; and as the Native populations become increasingly concerned about the impact of related activities on their lifestyles and traditions. We have been concerned for years over the lack of a comprehensive statement for the U.S. Arctic research goals and objectives, and the absence of effective coordination of Arctic science and technology. Of all countries bordering on the Arctic, the United States is the only one without coordinated Arctic science policy, and without a national institute, laboratory, or any other organization devoted exclusively to the sustained planning and support of Arctic research. Responsibility for planning, implementing, and funding Arctic research is divided between several Federal agencies, the State of Alaska, and private groups, whose mandates or objectives are separate or unconnected.

Arctic research, Mr. Chairman, bears some very distinctive features, which have led to these difficulties in implementing effective research plans. Let me mention just a few, leaving out the more obvious ones, such as high cost, and adverse climatic conditions. For instance, because support for Arctic research has been low and sporadic, the pool of scientists and engineers experienced in the study of Arctic problems is very small. Since many specialties important in the Arctic are taught at only a very few universities, the cadre of trained personnel necessary to the solution of many Arctic problems has just not been developed.

Certainly many research problems of major importance in the Arctic do not fall logically into existing funding and organizational structures, and tend to be ignored because the lines of Federal responsibility are not clearly defined. In particular, since Alaska is the only Arctic State, many Arctic research projects are perceived by Federal agencies as being of strictly Alaskan interest, and thus are expected to be funded 100 percent from State sources. Finally, basic site specific data, similar to those collected in other regions over long periods of time, are missing in the Arctic. And this lack of continuity makes it very difficult to assess, for instance, the magnitude of long-term environmental changes that may result from developmental activities.

What is needed, Mr. Chairman, is that the Government of the United States make a clear and unequivocal statement of its commitment to the support of scientific research in its Arctic territory, and in all other areas of the Arctic and sub-Arctic that are of specific interest to the United States. I'm happy to have learned yesterday that the Interagency Arctic Policy Group is preparing a memorandum to the National Security Council, which hopefully will end up on the desk of President Reagan to be issued as a Presidential directive precisely on this commitment to Arctic research. The commitment, however, should be implemented by specific actions to improve the coordination and effectiveness of Arctic research programs, and insure the continuity, stability, effectiveness and control of funding of research in the Arctic regions. The introduction of Senator Murkowski's bill is the first fundamental step toward that goal.

Mr. Chairman, in the light of these statements, I would like to make a few specific comments on the text of S. 1562. First, I would like to express our agreement with all points in the section on findings and purpose of the bill. I respectfully suggest that in that section, reference also be made to the potential, for instance, of strategic minerals in the Arctic regions. Other regions of U.S. interest, such as Svalbard and the eastern Arctic Ocean, should also be included. More examples of needed basic and applied research should be listed. Second, we believe that the establishment of a small independent Federal commission under the executive branch would have a greater potential for the development and implementation of a policy guided national Arctic research plan than the Arctic Research Council, as proposed in the bill. A congressionally established independent commission, assisted by an advisory committee with experts drawn from public, private and local sectors would be better suited to lend guidance to relevant agencies for coordinated efforts to promote cost-effective development of Arctic resources, protect the human and physical environment, and aid the U.S. Defense posture in the Arctic.

An example of this type of independent commission envisages here in the Marine Mammals Commission established under title II of the Marine Mammals Protection Act of 1972. Third, I would caution against adopting a too narrow definition of the term "Arctic" for the purpose of the bill. A U.S. Arctic research policy should deal with all those high northern latitude areas of direct interest to the United States, in which cold climate, frozen ground, ice-infested waters, and auroral phenomena pose special problems to life, human society, economic development, and defense. This ends, Mr. Chairman, my brief statement, and I will be very happy to answer questions.

Senator STEVENS. Thank you very much. I appreciate your comments.

Dave Hickok, speaking for the Alaska Council on Science and Technology.

Mr. HICKÓK. Thank you, Mr. Chairman.

Governor Hammond told me that he was sorry he couldn't attend here, but he will be looking forward to testifying in Washington at another hearing.

Mr. Chairman, I am Dave Hickok, current chairman of the Alaska Council on Science and Technology, and director of the University of Alaska's Arctic Environmental Information and Data Center. Thank you for this opportunity. May I join my other colleagues throughout Alaska, and those interested in the Arctic, in applauding the initiative of Senator Murkowski in introducing this legislation, and in applauding Senators Stevens and Jackson, in joining with him in cosponsoring S. 1562.

The imperative for this Nation to articulate and commit its support to a strong coherent arctic science policy has never been greater. It isn't a new effort, of course. The long history of prior efforts is set forth in a publication my colleagues and I authored under the aegis of the Arctic Division, AAS, entitled "United States Arctic Science Policy." I have no reason to repeat this history here. Suffice to say that it began in 1964 when Senator Bartlett—just as you, Senator Stevens, have done more recently—brought attention to the great disparity in national funding between Antarctic and Arctic research, in the Appropriations Committee of the U.S. Senate. Efforts to prepare an executive branch commitment to Arctic policy continued under the aegis of the former Federal Field Committee for Development Planning in Alaska. And after 3 years of effort, within all—involving all executive agencies, a U.S. Arctic policy position was agreed upon, and forwarded to President Johnson for signature in 1968. Unfortunately, the President became ill in his latter days of office, and did not sign the statement.

In 1969, the Federal Field Committee, also working with Dr. Edward Wenk, then Executive Secretary of the Marine Resources and Engineering Development Council, prepared another Arctic science policy statement, which was adopted and published by that council in their 1969 report, Marine Science Affairs, a year of broadened participation. To this day, that brief statement remains this Nation's only substantive official Arctic science policy statement. Through the 1970's, many other attempts were made in the executive branch to secure sustained and coordinated Arctic science programs within the framework of national policy. All efforts failed, due primarily to bureaucratic rivalries and budgetary protectionism.

Last year, somewhat in despair, but ever hopeful, my colleagues and I set forth the premise that only the Congress could provide the necessary forum for resolution of the disgraceful condition of

U.S. scientific endeavor in the Arctic. Now we have a chance, thanks to the sponsors of S. 1562, to begin anew, and forge a policy framework for U.S. Arctic science programs which will show the way to national achievement and enhancement in resource development, national defense, human and community condition, environmental protection, transportation, and communication in the Arctic.

Many of the imperatives I see for a strong coherent national commitment to Arctic science are set forth in our white paper, "U.S. Arctic Science Policy." With your permission, Mr. Chairman, we'd like to make our paper part of the record of these hearings.[1]

Before leaving the problem of national need, however, let me emphasize the extremely important and prerequisite role of scientific and engineering research in natural resource development. Given the extreme importance of oil, gas, and strategic and critical minerals, to the general economy, societal well-being, and the fiscal position of this Nation, it is utterly beyond my comprehension that we as a people have not mounted an all-out effort to find, develop, and appropriately transport and market these resources which we know to exist in Arctic Alaska, both on and offshore. The role of scientific and engineering research in accomplishing this objective is paramount. Such research can give us the comprehension of natural systems and forces which will allow us, for example, to properly design and build ports and harbors and offshore facilities in ice-stressed seas, and to build ships needed for research and trade, and for carrying oil, gas, and minerals. We need to properly assess environmental impacts, and promulgate any necessary mitigative measures for the living resources of our land and waters. With proper assessment, we can time resource development activity so that cost-effective operations can be achieved in balance with environmental and living resource concerns.

One example, Mr. Chairman, is the problem that lies in the so-called drilling window question, about which greal discourse is taking place without a complete factual foundation for a solution. Other prominent needs for the application of research to resource development progress exist. And these are but a few examples.

I'd like to make a few comments on specific conceptual emphasis matters in the bill itself now. The question of what the Arctic is and means, rather than a definition per se, should be addressed. In this context, I agree with my colleagues here at the table, that we need to recognize the definition on a arbitrary political rather than on a scientific basis. The reason for this is that the definitions based upon scientific measures, permafrost, treeline, sea ice limits, et cetera, all vary. Functionally, the Arctic might be best described in U.S. political, social, economic and scientific interests. These interests are national in nature and transcend Alaska per se. And thus inclusion of the basin of the Arctic Ocean and the Greenland Sea are equally important to U.S. territorial interests in Alaska lands and waters. For recognition of Alaska's Arctic, I'd recommend inclusion of all lands north of the PYK line referenced in the Alaska Statehood Act, and all waters north of the Aleutian Islands, including the Bering, Chukchi, and Beaufort Seas.

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[1] See p. 343.

On the question of scientific information transfer, there needs to be a recognition, I think, that there are several institutions in the Nation working on this. One is my own institute at the university here. And to a certain extent, we need to know what funds are available. We have in place a network of information exchange, and it seems to me that the proposed Arctic research council could help to bring these various centers of information transfer together more formally, to develop a more comprehensive information exchange network, but I would caution the committee that just having one center of information is not appropriate. I think that would be a step backward.

On the matter of the Arctic research council, in general I concur with my other colleagues here, but first, this council needs to be a Federal council. However, its membership should transcend just three agencies, and also recognize the national interest of over 100 universities involved in Arctic research in Alaska, and many industrial private sector involvements. After all, we desire here to solve problems, and these problems involve many interests. One way to do this would be to have the President appoint the council with a designated Federal chairman, and other Federal members appointed to represent academic, industrial, private sector, and Native interests. The Federal council might also be supported by agency, industrial, and university advisory committees.

As to the question of the future of the NARL, we need to be realistic. NARL has essentially three major assets. These are: One, it is economically beneficial to the local residents; two, it is a symbol of U.S. Arctic science presence; and; three, it is a useful, specific support base for the conduct of scientific inquiry within the Arctic Basin, and scientific research of opportunity due to location on such problems as the populations and behavior of the bowhead whale, research into impacts on natural systems occasioned by oil development of the National Petroleum Reserve in Alaska, and site specific sea ice research along the coast of the Beaufort Sea.

We must realize however that U.S. Arctic research interests greatly exceed the region of NARL's potential involvement, stretching today from the Aleutian Island arc past St. Lawrence and St. Matthews Islands, Bering Strait to the high Arctic basin, the high Canadian islands, to Greenland and Spitsbergen, where the United States has treaty-granted resource, and very special specific national defense interests in Arctic research.

NARL, in my opinion, should be managed by some kind of an operating authority established by the Federal council. If the State is to be involved with costs of NARL's operation, as proposed in the section 1007 report, the State also needs to have a direct voice in the approval of management schemes proposed, and the programs to be executed.

Finally, a comment on the funding approach set forth in S. 1562. As the committee is aware, various approaches to Outer Continental Shelf shared-revenue formulas are being advocated by individuals in the Congress, and reportedly also by Secretary Watt. Although several interests, coastal zone planning, grants for community impact from oil and gas development, funds for the National Sea Grant program and Arctic research may have to be accommodated by OCS shared revenues, I would regard this as an opportunity rather than a hindrance to this legislation in the long run.

A larger constituency supporting the concept of shared revenues from the OCS should break down—help to break down the barriers to formula funding long held by the Office of Management and Budget. Once we can surmount the conceptual objection, then it becomes a horse-trading situation on how much we will get and how we'll handle it.

In closing, Senator Stevens, may I also say that the Alaska Council on Science and Technology has held several policy meetings here in Alaska, public meetings, in an effort to put together statements on Arctic science policy, and indeed, on the companion Alaska science policy. We would like the opportunity, with your concurrence, as a committee of the council, to further send to the committee specific language on potential enhancement of the legislation.

In closing, let me again thank you, Senator Murkowski, and Senator Jackson, and yourself, Senator Stevens, for the introduction and opportunity to appear before you today.

Senator STEVENS. Thank you very much, and we welcome your suggestions for changes in the legislation.

Dr. Vera Alexander, for the Institute of Marine Science at the University of Alaska, please.

Ms. ALEXANDER. Senator Stevens, Senator Murkowski, thank you very much for allowing me to testify this morning. The United States has a very great stake in its northernmost lands. In order to insure optimal development, conservation of resources, and environmental protection we must maintain a critical level of research effort. The research areas directly applicable to Alaska are very important, but many of the research areas which need attention also have global and national importance, since the Arctic is a multi-nation mediterranean area. Furthermore, Arctic regions also have a strong global influence on processes such as climate. In order to insure such a critical level, I strongly support the promotion of an Arctic science policy, and the major elements of this proposed legislation. In particular, I believe that a coordinating mechanism is essential. I tend to agree that there may be some question about the exact management proposed, but I'm sure that these details can be worked out better by others than myself, so I will not address them any further. Obviously, financial support for science must also be available, but that will not solve the problems by itself. Pouring lots of money is not the solution. All these other elements need to be brought together, too.

I'm not prepared to address the question of a laboratory. There are several options for land-based support. These have already been addressed to some degree, and I won't emphasize that too much, either. What I really hope will emerge from all this activity, in particular the deliberations in connection with this legislation, is that a U.S. sensitivity toward the Arctic will evolve.

One problem we face is very evident. My National Science Foundation friends tell me that it is very difficult to emphasize an Arctic program in a similar way to the Antarctic because of the fact that all our national Arctic lands fall within one State, and any priorities look like preferential treatment of one United States region over others. Nevertheless, I would like to make another point that the real problem with the support at the basic National Science Foundation level is not the scientific support, but the lack of recognition of the logistic costs for Arctic research. This is a serious problem. The research dollars spent are not that different between the two regions. What is different is that in the Antarctic, logistics and much of the equipment, is budgeted separately. In the Arctic, it comes out of the science budget directly.

It is not recognized that costs are high, and yet the large multidisciplinary programs of the kind that are needed to understand the marine systems of Alaska, and the problems such as ice dynamics involve very high logistic costs. Alaska not only has the greatest portion of the coastline of the United States, the majority of the continental shelf of the United States, much of which is at least seasonally ice-covered, but also, a huge potential in subsea mineral resources, and vast renewable marine resources, some of which have already been seriously impacted by overfishing.

Many land-based activities, especially in the far North, are going to require marine transportation through ice-covered waters. A significant portion of Alaska's population lives on or near the coast, although much of this doesn't fall within the Arctic, by the current definition. But it's certainly not in the interests of the United States to ignore these facts, and I'll now address some of the marine problems. The background necessary to understand the needs for management of fisheries, for example, is a broad-based comprehensive marine research program that provides understanding both of the marine systems, and their biological stocks. Most of the fisheries research emphasize the biological stocks while ignoring the fact that they live in the ocean. Physical and chemical oceanographic processes, as well as biological oceanography and fisheries science are all needed to address such questions. In other words, you must study the whole system.

This kind of work needs to be done in all of Alaska's seas, and in the more northern regions, requires specialized logistic approaches which include icebreaking ships, aircraft, and remote sensing from aircraft and from space. Marine mammal research, as well as fishery research, cannot be carried out in isolation, but needs to be approached from an ecosystem perspective, and the present lack of an icebreaking ship is especially serious in impeding work which needs to be done in the seasonally ice-covered Bering and Chukchi Seas. Presently, ships of opportunity are used for this work.

Let me give you an example. In my institute, during the past 6 years, four marine mammal research cruises have been undertaken on Russian vessels within sight of the U.S. coast, because the United States has been unable to provide the support for this kind of work. We're very happy to have this opportunity to use the Russian vessels, but it would be highly preferable for the United States to have their own logistics, and perhaps in the long run, a little safer, too.

Problems related to the safety and health of Alaskans are also to be considered. One example, again, not an Arctic region by our definition, but it's a good one. We don't have enough information on the circulation of Prince William Sound to be able to predict where trajectories of the icebergs calved from the Columbia Glacier are going to go; and nobody will question that this could be a hazard with the tanker traffic and other increasing traffic there. We need to understand more about storm surges and coastal erosion in the Beaufort and Chukchi Seas.

Now many of the newer effective approaches to studying such vast areas as Alaska involve rather large sums of money; for example, satellite remote sensing, which is very effective in studying ice dynamics, but requires not only the satellites, which are not the big expense from the point of view of the researcher. The costs of handling the data are very high. For marine mammal studies, too, remote sensing from satellites and aircraft is an effective approach. Now these kind of things are just the tip of a mountain of urgent research needs.

Certainly everybody recognizes the need for environmental assessment in relation to development of the coastal zones, mineral distribution, geological processes, and all these things. Much of the marine research mentioned can be done from a good oceanographic vessel, from aircraft or helicopters, but a critically large proportion requires an ice-strengthened ship. In this regard, the United States lags significantly behind other nations. We have, of course, a very small fleet of icebreakers. These however are not designed for marine research. Their primary missions are not research. Many of them are old. The two newest ones are way too large to be economcal, to be dedicated to research for any length of time. And in many cases, scientists can't get on board anyway. The United States is slipping even further back as other nations are launching new ships. Even apparently nonpolar nations are better off than we are in this regard. In December 1981, Japan launched a new icebreaker to be dedicated entirely to research. And of course, the Russian fleet outranks the United States by a huge margin of about 60 ships. I have information on the relative numbers of ships of ice capability that the different nations had separated into icebreakers versus research ships, and I'll be glad to attach this to the record, if I may do so.[1]

Senator STEVENS. Please.

Ms. ALEXANDER. Let me give you one final example of this ship problem. A rather small nation, Finland, with not much of a marine-based economy, has a fleet of small icebreakers which are available almost on an equal time for research, as well as the other more practical defense purposes. And they also have a small ice-strengthened oceanographic research ship. Obviously, they have problems with shipping in the ice-covered Baltic, but certainly, nothing compared with the potential for problems with shipping in the Beaufort, Chukchi, and Bering Seas. The relative size of the two marine areas just simply cannot be compared. This proposed legislation provides a framework for addressing some of these problems, and hopefully will result in an effective approach to coordinating and funding marine as well as other Alaskan research. Thank you.

Senator STEVENS. Thank you very much. Questions, Senator Murkowski?

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[1] See p. 94.

Senator **Murkowski**. Well, I have an observation about our first witness, Dr. Max Brewer. I think he coined the term "National Research Laboratory" for the first tme, as it was formerly known previously as NARL. Let's commend Max on that. It's certainly an appropriate name. I assume Dr. Brewer, you coined it for that reason?

Mr. **Brewer**. Yes. Also, it makes it easier for the mapmakers. [Laughter.]

Senator **Murkowski**. I have a couple of questions that I'd like to proceed with, Senator Stevens. You indicated, Dr. Brewer, a concern over the perhaps unwieldy, although you didn't use that terminology, makeup of the proposed policymaking group, and suggested that the appointment under the executive branch, of a smaller group of scientists might work better, because of the time constraints on the Secretary of Defense, Secretary of the Interior and Secretary of Commerce. One of our initial considerations was whether or not there should be some high visibility from the various secretaries in order to attract enough attention on the necessity of Arctic research and the fact that we haven't been doing it, let alone coordinating it. I'm wondering if, as part of your recommendation, you feel that we can give on that point, and should construct the selection around the independent scientific community as you suggested. Are we giving up a lot if we give up the Secretary of Interior, Secretary of Defense, and Secretary of Commerce roles?

Mr. **Brewer**. Senator, I recognize the high visibility aspects. Sometimes that might not be helpful under certain conditions, but what's important to me is that we have continuity for a program. We need a group of people who can spend time thinking about it in a certain amount of detail, that will perhaps not change frequently, or not tend to be represented so frequently by alternates who may change from time to time.

Senator **Murkowski**. Perhaps you could just make a suggestion for the record. How can we make the appointments? Who'd appoint them? The executive branch? Who would submit the list?

Mr. **Brewer**. I believe that if you were to have a commission, that at least the chairman, if not the entire commission, would probably require executive branch appointment. I think that there should certainly be close attention paid to the Senators most familiar with Arctic problems. And I think it would be helpful if, in making some of their recommendations they solicited suggestions from the scientific community. I think that if a commission, a small commission, were established that in effect ran the laboratory, that it would have greater chance of doing what you feel is an intent of the bill.

Senator **Murkowski**. On the question of funding, you are aware, of course, of the proposal that we take about one percent of OCS revenues? You suggested that there should be some type of Federal subsidy. Is this in lieu of what's already proposed in the bill, or are you suggesting an additonal source of funding?

Mr. **Brewer**. There is a need for a type of continuous funding. I did not suggest in lieu of, or in addition to, sir.

Senator MURKOWSKI. I have one other question. What would you anticipate it would cost to keep NARL open at a reasonable efficiency capability on an annual basis?

Mr. BREWER. I think that that has to take . . .

Senator MURKOWSKI. It has a lot to do with the mission, obviously.

Mr. BREWER. Yes, and I think it depends somewhat on the management. For instance, this fiscal year, the Federal Government is providing $6.4 million for the operation of the gas field, and caretaker of the NARL. Now, certainly if the gas field operation were to be continued out of the NARL, part of the funding that is already committed for this year would be substituted for other funding. So if we assume that the management costs $6.4 million this year, I would think that one could have a good research program at the NARL for about $6 million in grant, and an additional $3 million operational. But it would be a joint operation of the gas field program, and a scientific program. Part of the first year's $6 million grant would need to go to upgrading some of the scientific equipment and other items that have deteriorated, but a program is a little slower in getting going, and I think that that could be worked in.

Senator MURKOWSKI. Thank you.

Senator STEVENS. Thank you, Dr. Brewer.

Senator MURKOWSKI. Mr. Chairman, I have other questions, but maybe it'd be better for you to ask questions now, then we can go through each one. I defer to your questions.

Senator STEVENS. Max, I have a feeling that if we could establish for our colleagues that the costs of existence and development in Alaska have an impact on the tax structure of the country, and that research and development of an Arctic policy might reduce those costs, that they might see the advantage of giving us the funding that we need to maintain NARL, and also to maintain the very high level of activity of the university in related research. For instance, costs of the pipeline were staggering to most people. There's some indication that if there had been advance planning and research "on the shelf," that they could have used and relied upon, that some of those costs could have been reduced substantially, that those costs are deductions from the income that's being derived from the sale of the petroleum. I think there is a direct tax base loss to the Federal Government as a result of those high costs. Do you agree? Do you see this kind of policy and the development of basic research, giving us some ability to reduce the costs of development, reduce the costs of the continued living of those associated with development. I know that our Native people would like to have the benefits of that research, too. I'm thinking about the tax and revenue impact now of such a policy and related research. Do you see that being realistic?

Mr. BREWER. Yes, sir, in fact, I would be willing to sell the need for Arctic research laboratory strictly on that basis, not even bring forth man's need for knowledge or other aspects. For instance, in 1957, at the dedication of the DEW Line, the Canadian naval attaché in Washington presented to the Office of Naval Research a letter stating that the costs that one single project opperating at the NARL had saved in the construction of the DEW Line, far outweighed the total costs of operating the NARL in its first 10 years of existence. Here in the data that an old project at the NARL was able to provide to the exploration program on the National Petroleum Reserve, 1981, in the construction of thin pads the savings to the Government in appropriation, through the design of two of the four thin pads that were designed that year, would have generously funded the NARL operation scientifically all that year, and yet they were poor. Prudhoe Bay No. 1 is a well that visitors normally are not taken to very often, because there was a very considerable learning curve, as far as protecting the environment.

It was followed by Sag River No. 1, the well that is at Prudhoe, and where the visitors come today. In drilling that well the people wanted to drill it during the summer, and so they came to the NARL asking for designs that would assist them in maintaining a drilling operation through the summer, since the previous year on the Prudhoe Bay well, they had had to suspend during the summer—it'd taken them about 16 months to drill. The design was provided to them on a Sunday afternoon. They went ahead and that is the two-stage construction of the Prudhoe airstrip you see today.

At the same time as that meeting, it was suggested to the company that perhaps they didn't like their stockholders, because they were throwing all their money down the drain in their environmental control, and besides it'd probably cost another million in PR. Suggestions were given to them as far as construction and operation from pads and from roads. The following year in Rolla, Missouri, the company admitted that doing the job right at the Sag River Well No. 1 was a lot more pleasing as far as the eye could see, met a lot less resistance from the environmentalists, and cost less dollars then the development of Prudhoe Bay No. 1.

Now, there are other things that would impact there, but it's that type of thing. And if we don't provide information, the Government agencies, in their regulation are going to so over-regulate the industry that the engineers are going to have to go far beyond, in many instances, what they should do, causing damage to the environment, costing the company money which will then reduce the taxes that the company provides to the Federal Government.

Senator STEVENS. Thank you very much. That was my feeling, also.

Go ahead, Frank, with the other questions.

Senator MURKOWSKI. Thank you, Mr. Chairman. I have a question for Dr. Roederer. Perhaps you could elaborate a bit more on how you feel the development of an Arctic science policy affects our strategic national defense needs. I think you mentioned it, but perhaps a little elaboration would be helpful.

Mr. ROEDERER. Mr. Chairman, the United States has never fought a war in the Arctic, or even under truly Arctic conditions. Our principal potential adversary has not only won wars in the Arctic, but it has won those wars because of the Arctic, or Arctic conditions. Let me throw out a few questions here. What research is being done concerning performance of smart weapons from single, heat-seeking missiles to terrain-recognizing drones under ice fog conditions, or under an intense aurora display? What research is being done on the effects of higher latitude space disturbances on orbital or over the horizon surveillance systems? What research is being done on the basing of weapon delivery systems in frozen ground? What research are we doing on the effects of snow and permafrost on seismic and acoustic vehicle- and personnel-detection devices? What research is being done on radioactive fallout dispersion in the Arctic atmosphere? What research is done on the construction and operation of underground command posts and powerplants in permafrost areas? What is done in studying adequate protection of pipeline installations from terrorist attack, or terrorist seizure? What research is being done on chemical warfare in arctic climate? What research is being done on auroral effects on military space systems in general? What are we doing to study the prediction of the effects of high altitude nuclear detonations in auroral regions?

In summary, what research is being done relevant to the defense of the resource extraction systems of Alaska? Are we just hoping that combat will never take place in the Arctic? Of course, a public Arctic research policy will never address explicitly, nor include this kind of research which is of strictly Department of Defense incumbency, but I trust that the policy will create a research environment conducive to provide DOD with crucial information, environmental data, basic research, and above all, expert manpower needed to answer a myriad of relevant technical questions. And the mechanism set up for an arctic research policy will also serve as a conduit to channel specific questions, and present relevant research opportunities to the civilian scientific community.

Senator **Stevens**. Thank you. I think that's a very expansive answer, and covered certainly a number of concerns that are not being met, Doctor. You indicated, too, as well as Dr. Brewer, your recommendation of a small, independent commission, and we certainly note that recommendation in the record. You also suggested inclusion of a strategic minerals area, on which I would concur. You have also suggested inclusion of the eastern Arctic beyond, into Canada, into Greenland, and so forth.

Mr. **Roederer**. Yes, and east of there; Svalbard, for instance. We are signatories of the Svalbard Treaty, and have a right through that treaty to conduct research on Svalbard. We have even a right to buy land on Svalbard. Svalbard is in a, not only scientifically, but quite obviously, general defense strategic position, so I think a great effort is warranted to be conducted there. An arctic research policy will help coordinate this effort. I think it's mainly a question of coordination between Federal agencies, and with scientific, academic, and private sectors, and, in our case in Alaska, the Native community, to improve cost effectiveness of all these operations.

Senator **Murkowski**. Thank you, Doctor. Senator Stevens, no further questions.

Senator **Stevens**. As the Navy lost its control over the naval petroleum reserve, it lost its ardor for spending its funds for NARL, and we have been through a period of years now, as many of you know, trying to find a host entity to continue the role of maintaining the laboratory, and being the hosts for other Government-supported scientific people. In the process of that, I've come across several times, the relationship of the university to that group. You have heard what Max Brewer suggests. How has the university been affected by not having the continuity factor of the Navy that we had before?

Mr. Roederer. Well, certainly it has been affected. The university was the host organization, and was the umbrella organization for NARL. The university has benefited from that status by giving opportunity to their own staff to conduct research in the North Slope area. That has disappeared. In that respect, the university has lost opportunities for research, or since research does go on, was forced to turn to alternatives that are certainly more costly.

There is a statement, an official statement by the university, which President Barton has submitted to the study that was done on section 1007. The university said in July, last year, that the closure of NARL would not appreciably affect ongoing research programs. However, as we look into the future, the lack of U.S. presence in the Arctic could well have a negative impact on university research activities. The only way to compensate for the negative results of closing NARL will be the development of a strong Arctic research policy statement.

Senator Stevens. Thank you very much. Do you have any questions of any of the witnesses?

Senator Murkowski. I have a question of Dave Hickok. Your comments with regard to the development of an Arctic policy during the Johnson administration, and the fact that it was never enacted, never signed, was there anything particular in that proposed policy statement that you feel has been eliminated from this proposed legislation, that should be included?

Mr. Hickok. No, I do not think so.

Senator Murkowski. Senator Stevens, do you have any questions of Dave?

Senator Stevens. Well, we look forward to hearing the Governor's testimony. I think the real problem we have here is with our State's revenue base. We have made demands on the State for more than its fair share of contributions to maintain a laboratory and develop an Arctic policy. Has the State legislature approached you with regard to this concept yet?

Mr. Hickok. We've had several conversations with legislative members, and also with the Governor's staff on the question of sharing in the operations of NARL. The issue, I think, is one of participation. I think the State is willing to contribute funds up to that point where it also shares in the management decisions. The section 1007 report urged the expenditure of one-third State dollars for the operation of NARL, with only an ex officio representation. And clearly, that is out of the question for State interests. It would have to be a real partnership. And that's why some of us have been suggesting that an operating authority be established in which the Federal Government and the State government both participate in financial support in a policy arena. The operating authority would manage the laboratory. This way, you can also bring folks from the North Slope Borough, and other involved individuals, in the actual operations of that facility.

Senator Stevens. Well, what about the other side of the coin? If NARL closes, isn't the State going to incur a substantial cost in any event, to continue research that is vital to our State, and our own existence, without regard to Federal policy or Federal expenditures?

Mr. HICKOK. I would concur in that generally. I think the State administration is looking toward larger resource situations. For example, oil and gas activity is moving very significantly to the Bering Sea, off the coast of Nome and the Norton basin, and other areas. So the State's interests and knowledge not only involves the Beaufort and Chukchi Sea, and the location of NARL, but also other areas of their concern.

Senator STEVENS. Well, in the offshore area, we don't get any State revenue, but on the onshore area, we get 90 percent of the Federal revenue. We have our own revenue base from State lands, and we seem to have a predominant revenue base from any development as far as resources are concerned onshore. I wonder if we're losing sight of the fact that if this facility really is eliminated, that we may have the burden of developing Arctic policy and maintaining Arctic research all alone.

Mr. HICKOK. Well, I don't think Governor Hammond's staff or anyone in the State scientific community is suggesting the demise of NARL. I think the question for the State is what is the proper sharing arrangement between the Federal and State government? The partnership idea has not really been articulated far enough, in my opinion, Senator.

Senator STEVENS. Well, do you think that the State is aware of the situation or is aware of what's going to happen if some kind of cost-sharing arrangement isn't developed?

Mr. HICKOK. I think certain members of State government are aware, certainly.

Senator STEVENS. Thank you very much. Do you have questions for Dr. Alexander?

Senator MURKOWSKI. I have a question for Dr. Alexander. You indicated that there's a difference between the way the Federal Government looks at Antarctica and the Arctic. Is that due in your opinion to the fact that we have a high degree of international competition in Antarctica? Is that the primary reason that the budget process is treated differently—because the logistics costs and the scientific costs are separate for the Antarctic, but considered together for the Arctic?

Ms. ALEXANDER. Oh, yes, certainly. It's really based on the background of the whole Antarctic program which originated with the Antarctic Treaty. The treaty put our involvement in Antarctic in a diplomatic perspective rather than in a pure scientific situation. And as a result of this, the mandate for continuing the Antarctic program has always come from the executive level. And therefore, that particular budget has not taken as much of a slashing. In fact, Antarctic funding has been preserved reasonably intact over the years. The logistics also developed historically: At one point the Navy carried out a large proportion of the logistics under separate funding, and then finally the entire program was assigned to the National Science Foundation. In addition, the Coast Guard had some independent funds to provide for resupply and that kind of function. Now, even that money is being transferred to the National Science Foundation for administration, so that the tendency is to put all of the Antarctic research under one umbrella. Although there's a little tendency against it again now.

But the main thing is that within the Arctic, the argument is that many different programs within the National Science Foundation are funding Arctic research, for instance, ecosystems analysis, oceanography division. So the polar programs does not carry the full brunt of the funding for the Arctic. Also, there's really no good way to handle the logistic problem. There's no money set aside. The Arctic program is seen as competing against all othe science within the foundation, except for that portion of the budget that's set aside for Arctic support in the division of polar programs, which as I mentioned, is not that much smaller than the Antarctic science budget, but most of it in fact does not necessarily go for science.

Senator MURKOWSKI. Thank you, Dr. Alexander. I would think, Senator Stevens, it would be appropriate to have testimony from the Coast Guard in Washington at the next hearing. I have no further questions of the witness. I do have one statement at the conclusion for the panel. But I would defer to your questioning of Dr. Alexander.

Senator STEVENS. I'm intrigued by this vessel of opportunity concept that got us to the point where we're using Russian vessels for research. Is that federally supported research?

Ms. ALEXANDER. Yes.

Senator STEVENS. What kind of research?

Ms. ALEXANDER. Research on distribution of walrus, and the ecology of walrus in the Bering and Chukchi Seas. Some research on seals. It's mostly been for marine mammal research that we have used the Russians vessels.

Senator STEVENS. Did you do the research on Russian icebreakers?

Ms. ALEXANDER. Yes.

Senator STEVENS. Did they have special capabilities that we don't have?

Ms. ALEXANDER. Many of the Russians vessels I'm not specifically familiar with, because I wasn't on board with these vessels, but many of them are ice-capable ships that are designed for research purposes, and are maintained for that purpose. I know this is true of the Antarctic program, too. For example, many U.S. scientists wish to study a structure known as the polynya in the Antarctic during the winter. The United States couldn't provide a ship that could safely get into there, so a joint United States/Russian expedition went in this Antarctic winter successfully, with no problems. Apparently the ship was very capable of carrying out scientific work. It was not just an icebreaker that could go through ice. It could really function. So I think they're way ahead in this regard.

Mr. HICKOK. Senator, if I could interject, the Soviet Union has over 20 ice-strengthened research vessels, Canada over 9, Norway over 8, United States doesn't have 1.

Ms. ALEXANDER. We have one, the *Hero,* but she's entirely in the Antarctic.

Mr. HICKOK. It has a sail on it. [Laughter.]

Senator MURKOWSKI. Well, at least it's quiet.

Senator STEVENS. Dr. Alexander, in terms of our fisheries management, I have the impression that the Arctic Ocean is really a vast resource base for the food chain for the whole North Pacific. Are we suffering in terms of fisheries management from not having a firm Arctic policy as far as our country is concerned?

What's the impact of not having an Arctic policy in terms of fisheries management?

Ms. ALEXANDER. Most of the fisheries that we're talking about that are a real problem are not actually and technically in the Arctic.

Senator STEVENS. What about the food chain?

Ms. ALEXANDER. The food chains to some degree are a problem, yes. We are suffering most definitely. Especially because we really don't know how these Arctic food chains operate, so we can't even approach an understanding of how they might affect the fisheries. For example, the shallow systems over the Chukchi Sea shelf. We're just beginning to get an idea of how these systems might work, in terms of the importance of the organisms that are living in and on the bottom, which are also primary fisheries organisms. We need to know more about their relationship with the marine mammals, because after all these are the important feeding grounds of marine mammals, both those that are resident here year-around, and those which are migratory. In fact, this is one area which you could think of as our strong national interest, because the northern waters provide the feeding grounds for migratory species that spent a lot of their time elsewhere, but do come here to feed. So obviously something is going on, but we don't understand the system well enough to know what exactly. We now think that in the Artic Ocean, in the near-shore areas, there are hot spots, where the biological activity is strongly concentrated, and that these hot spots are related to physical oceanographic structures of which we know very little. These systems need to be looked at before we can consider a fisheries policy in relation to these northern waters.

Senator STEVENS. Let me ask each of you if you'd want to comment: The Native community wants, as you've heard, to expand some of the functions of the council here to include Canada. Is there a broad-enough working relationship now in the scientific community to attempt to include Canada, the Soviets and Greenland in a working relationship to develop Arctic policy, as we have seen develop in the Antarctic as far as policy and research are concerned?

Mr. HICKOK. Can I start on that?

Senator STEVENS. Sure.

Mr. HICKOK. I think there are two dimensions to that question, Senator. One is there is a international scientific apparatus for Antarctica. It's called the Scientific Committee on Antarctic Research. There is no parallel to that in the Arctic. There is embryonic ad hoc committee, called Arctique, which of all places, has its headquarters in Monaco. The United States is a party to that, but it's not a formally-constituted body. In any event, it is a beginning of scientific exchange and policy development internationally. But prerequisite to international dialog, by U.S. representatives on an international body, we need to have our own house in order. Dr. Roederer has further information than I do, perhaps, on that.

Mr. **Roederer**. I fully concur with Dave's remarks. We do have projects, joint projects, as they've testified, even with the Soviet Union. We are running observatories on Svalbard. We have a chain of stations, geophysical observatories through Canada. We have joint programs with Scandanavian countries. And in many other areas with which I am not personally familiar, there are joint cooperative programs, but they are also piecemeal, mostly bilateral, they come and go, and while our partners usually have continued funding for these projects, we have seen more than one occasion where we had to drop out because we could not continue with long-term research. I think that in order to do away with this vacillating international scientific cooperation with other Arctic-rim countries, we must have, as Dave says, our house in order first. We must open our own channels of communications. We must have some organiation like the small federally-chartered commission that I have mentioned and proposed, that acts as a clearinghouse, that acts as the information center, and the persuasion center for the agencies to present a coordinated approach to international scientific relations for the Arctic.

Mr. **Hickok**. The earlier part of your question, Senator, had some other implications. We do have contact with the Canadian community. There is a representative of Canada on the Polar Research Board of the National Academy of Sciences. We have contact here in Alaska between the Arctic Operators Association and the oil industry. In my institute, for example, all of the research of the Arctic Operating Committee in Canada, that is not proprietary, automatically comes to us in Anchorage, as does AOGA material here in the State. So there is an information exchange. Also, there's been an information exchange through the Arctic Institute of North America, which is Canadian-based in Calgary. The tentacles are there, but it isn't as complete as it might be.

Senator **Stevens**. Max?

Mr. Brewer. I am somewhat fearful of trying to enter the diplomatic scene with an attempt to get an international policy until we've made up our minds that we want to support research in the Arctic, that we belong in the Arctic, and that we are going to provide commitment. If we make that determination, I think that the State Department, which would get into an international situation, could have something to talk about. But meanwhile, at least we would have a program commitment for support of the research.

Ms. **Alexander**. I might just add one thing to this, and that is that if we do get our act together, and we do get a strong science policy, and a visible high-quality scientific activity in the Arctic, I think at least on the scientific level, the contacts will follow, because there are some strong Canadian programs, at least, so that with Canada I think we'll be in contact. Also, we have problems that cross the borders, such as the whales that are already subject to joint investigation, to some degree.

Senator **Stevens**. I thank you all very much. Do you have any questions?

Senator **Murkowski**. I have one question for the panel. Any member who feels like taking it, go ahead. I am also on the Environment and Public Works Committee, and we have been spending a great deal of time as a full committee, on clean air legislation. Our testimony suggests that there is a high increase of industrial pollutants that are entering the Arctic. There is a rather stagnant air mass, particularly in the wintertime that's not coming from Alaska, but these pollutants are accumulating in our Arctic. As a consequence, there's more and more concern over acid rain, which is associated with this pollution, particularly in the northeast part of the United States, and over Canada. This type of legislation would include research in that area, but at this time, are we taking samples on a regular basis? Do we have information on current pH levels? In your opinion, is this a cause of substantial concern, or is it something that's perhaps blown out of proportion?

Mr. HICKOK. Well, I'll start off on it. There is evidence of acid rain falling in the Barrow area, and it is being monitored. There has been a meteorological monitoring station at Barrow. I don't know, Max, has it been continuous since 1884? If not, pretty close to it.

Mr. BREWER. 1921.

Mr. HICKOK. Anyway, we have a monitoring scheme still going on there. And yes, there is some concern. Various elements of nitrous oxides, or sulfur oxides, affecting the tundra could change the plant community through increasing fertilization. Make grass rates grow more, and less—the lichens and things of this kind. So there are some long range potentials there.

Senator STEVENS. Thank you.

Mr. ROEDERER. There's some research that has been going on for some years now at the university, jointly with other institutions in the lower 48. The research concerns certain elements that we find responsible for condensation of crystals in the atmosphere that probably originate in industrial activity in the Soviet Union and Europe. Very little is known about the circulation of the atmosphere on one side, and the residence times, which must be very long, of these constituents; but also, very little is known about the potential impacts on long-term climate of these pollutants.

This is not perhaps to be compared exactly with acid rain, which corresponds to nearby industrial activity emissions, and short residence times, but it is something that affects the entire polar area. No doubt that industrial activity in the United States conveys the same kind of constituents and particulates over Europe and the Soviet Union. There's a tremendous need for systematic, and I would even say, massive research concerning the origin, the dynamics of motion, and the potential impact on climate, on these kind of aerosols.

Ms. ALEXANDER. If I may add just one other small comment to this, too.

In Scandinavia, and in the Northeast United States, the biggest effects of acid rain were found to be on the freshwater environments.

Senator MURKOWSKI. Yes.

Ms. ALEXANDER. As far as I know, there has been no experimental work done in northern Alaska to find out what the effects of lowering pH on the ponds and lakes would be.

Senator **Murkowski**. Your comments have been most helpful. I think that there may be here in this issue, which is so highly visible, as "acid rain," that it may lend itself to a harmonious paralleling of our objectives here. In conclusion, I would certainly like to thank all of you for your outstanding testimony. I think it's representative of the scientific community that we're fortunate enough to have in the State of Alaska, and the University of Alaska as well. I think we can certainly be proud of the dedication and knowledge, and commitment that you've all make, and I'd certainly like to thank you for your testimony.

Senator **Stevens**. Yes, I think you too for your contribution, and your time and patience. I appreciate very much your participation in the hearing.

Mr. **Hickok**. Thank you very much.

[The prepared statements of Mr. Brewer, with attachments, Dr. Roederer, Mr. Hickok, Mr. Leavitt, and Ms. Alexander, follow:]

3819 Locarno Drive
Anchorage, Alaska 99504

13 June 1982

Honorable Ted Stevens
United States Senator
411 Russell Office Bldg.
Washington, D.C. 20510

Attention: Ms. Tonja Musko

Dear Tonja,

Attached please find the copies that you requested of,

1. My letter, dated 30 November 1981 and addressed to Dr. David Rickert, concerning the Draft Report on U.S. Arctic Research Policy and the Possible Roles of the Naval Arctic Research Laboratory.

2. My testimony, regarding S.1562 - The Arctic Research and Policy Act, presented before the Senate Committee on Governmental Affairs in Fairbanks, Alaska on 7 April 1982.

In response to your and Senator Stevens' earlier questions as to "what would the scientific community lose by the closing of the NARL?," I would have to answer in the following vein:

1. The long-term continuity of many scientific programs, but more importantly, the multidisciplinary interaction of scientists working on Arctic problems, i.e., NARL has provided the only U.S. scientific "think tank" attacking Arctic problems for the past 30 years;

2. Experience and training in how to accomplish scientific programs in an unique environment;

3. A major reduction in all cold weather scientific research, particularly as regards such subjects as the studies of sea ice composition, growth, and decay, sea ice dynamics and Arctic oceanography; geotechnical and geophysical studies, including upper atmosphere (communications) studies; and cold weather construction techniques, especially in areas having permafrost conditions, to name only a few; and

4. The most effective mechanism that the U.S. so far has been able to develop to try to bring a modicum of coordination in the research being accomplished in the Alaskan Arctic.

In response to your questions concerning past accomplishments at, from, or because of, support at the NARL, which would not have been possible were the scientists not working from a permanent year-round, reasonably well-equipped facility located along the North Alaskan Coast, I can provide the following examples for a starter;

1. The technical feasibility study for the DEWLine (1952-1953);
2. The development of fail-safe designs for airstrips, roads and building foundations for the Western one-third of the DEWLine (1951-1955); (The Canadian Government has stated that the resulting saving in DEWLine construction costs greatly exceeded the cost of all research accomplished at the NARL up until that time - 9 years).
3. Construction (ice thickening) and instrumentation of the first sea ice airstrip capable of handling P2V Navy bombers (1951-1952);
4. First utilization by the United States of multi-engine aircraft (a flying laboratory) to accomplish Arctic oceanographic studies (SKI-JUMP, 1951-1952);
5. Utilization of light, fixed-wing aircraft to conduct oceanographic studies and obtain gravity measurements (to 400 miles out into the Arctic Ocean) off the northern Alaskan Coast, in the northern Bering Sea, around Wrangel Island (USSR) and off the western portion of the Canadian Archipelago (1957-1961);
6. Establishment of and operation of 11 scientific stations on the floating Arctic ice pack to study physical, including bottom coring, and biological oceanography; to accomplish geophysical studies including gravity, magnetics, seismic, aurora and its impact on communications, underwater acoustics (submarine detection) and geothermal; to study polar meteorology, including micrometeorology; and to investigate sea ice physics, movements, and deformations (1960-1975);
7. Making four of the 11 recognized significant "northings" by world ships since 1849 (in support of drifting Arctic ice stations, including the first establishment of an ice station by the USS BURTON ISLAND in September 1960, which was duplicated by the USSR Atomic Breaker LENIN in October 1961) (1960-1967);
8. Studies of permafrost, including the solution to the problem of casing collapse in oil and gas wells in permafrost areas, which was published in 1959, and Arctic engineering (1949-1978);

9. Design of the permanent drilling and camp pads; the design of the two-stage Prudhoe Bay airstrip construction; the different design for the two-stage Deadhorse airstrip construction; the parameters for the permanent road system in the often-noted environmentally acceptable "model" oil field development at Prudhoe Bay (1969-1970);

10. The alert to the senior shipping masters of five major oil companies, including EXXON, ARCO and BP, that their design plan for utilization of the MANHATTEN-type ship for transport of oil from Arctic Alaska was not feasible (1970);

11. The information provided to the Department of the Interior, in conjunction with the U.S. Geological Survey, that about one-half of the Alyeska oil pipeline must be located above ground rather than the 10 percent above ground criteria as planned and advocated by the oil consortium (1970-1971);

12. Much of the environmental information used in the preparation of the Alyeska Final Environmental Impact Statement, in the Naval Petroleum and Oil Shale Reserves No. 4 FEIS, in the BLM 105(c) studies, and in numerous other environmental statements prepared for work in, or adjacent to, northern Alaska (1970 to date);

13. The design of the thin pad concept for use in drilling exploratory wells on the North Slope, wherein the thin pad is environmentally superior to the previously used thick pads. The savings in costs on just two thin pads alone would support research at, and operate the, NARL for a year. (1978-1981);

14. Refutation, including proof, of the charge that seismic operations miles away caused the death of caribou in the Pt. Lay area-they died of starvation occasioned by a heavy rainstorm the previous fall which iced-over much of the tundra (March 1971);

15. Refutation, including proof, that ringed seals do not pup in the Beaufort Sea in mid-March and that there is no need to prohibit seismic operations after that date, and prior to the end of April when they do pup, because of previous erroneous information (1976-1981); and

16. The development of winter construction and other engineering procedures which now have spread to other, even non-permafrost, areas.

Basically, what the examples would suggest is that some research in the Arctic can be accomplished only during the winter months, that much of the research needs a reasonably well-equipped base at which, or from which, to accomplish the research and that research, especially in an Arctic environment, is not a quick grab-and-run operation. The latter is far too expensive in cost and yields too little information, much of which may be erroneous either because of temporarily unusual circumstances, or because of a lack of understanding of the interdisciplinary causes and effects found in nature in an unique environment.

I hope that the examples provided can be of some assistance.

Sincerely,

Max C. Brewer

Max C. Brewer
Former Director, Naval
Arctic Research Laboratory
1956-1971

Attachments (2)

P.S. I believe that it also is worthy of note that the President and two Board Members of the Arctic Slope Regional Corporation, that the Mayor and the President and Vice President of the Assembly, as well as the Assessor, of the North Slope Borough, and that several members of the Board of the Barrow Utilities and Electric Cooperative, Inc. are former long-term employees of the NARL.

HEARING BEFORE THE SENATE COMMITTEE ON GOVERNMENTAL AFFAIRS

S. 1562 - The Arctic Research and Policy Act

Testimony Presented By

Max C. Brewer

Fairbanks, Alaska
7 April 1982

STATEMENT

Concerning Senate Bill 1562

My name is Max C. Brewer and I am appearing before the Committee as a former director of the Naval Arctic Research Laboratory at Barrow. I headed the U.S. Geological Survey's Arctic Ice and Permafrost Research Project at Barrow from 1950 until 1956, when I was appointed director of the NARL. I remained at Barrow in that capacity for 15 years, leaving in July 1971 to become Alaska's first Commissioner of Environmental Conservation.

I concur and wholeheartedly support the findings and purpose stated in Senate Bill 1562. The United States has great economic interests in the Alaskan Arctic and numerous responsibilities in many areas of the Arctic. In order to protect these interests and to fulfill the numerous responsibilities the Nation, and its agencies, must learn to know the Arctic, to become familiar with its environment, to understand its people, and to learn how to operate and live there in a more efficient and far more economical fashion than we do today. We, as a Nation, can no longer afford to make ad hoc decisions based on too little information about the Arctic lands and seas, and their inhabitants, or to continue to think that, just be adding more money, we can effectively operate there. Thus, there is a great need for an official commitment by the Congress to support research in the Arctic on a continuing basis.

While I favor the concept of a Council, as referred to in Section 3(a) of the Bill, or a Commission, if possible I would recommend that it be an independent Commission under the Executive Branch. The three secretaries proposed for the Council are busy individuals with many responsibilities, and, thus, would need to depend on other unnamed individuals to do much of the proposed Council's work. Some tender loving care by a few dedicated people with access to be heard, is needed for a research program to be either economical or successful in the Arctic, and to keep it from being swallowed up by the bureaucracy.

Other areas in the Bill that give me pause are:

1. Sec. 3(a) - The legislated invitation enabling the Administrator of the National Oceanic and Atmospheric Administration, the Director of the Smithsonian Institution, and the Director of the National Science Foundation to attend Council meetings appears to be a disinvitation for attendance by other agency heads, several of whom could have the responsibility for more operations in the Arctic than those named.

2. Sec. 4 (5) (B) - The requirement, for each user to pay all costs reasonably associated with its use of the NARL facilities, was the basic cause for the decline in the amount and, to some extent, the productivity of the research emanating from the NARL during the past several years. If good, particularly long-term, research in the Arctic is going to be accomplished, it will need some degree of Federal subsidy.

It has been proven at the NARL that the most economical way of providing that subsidy is through providing logistical support free of charge to all governmentally supported users and at a nominal cost to industry users. That approach eliminates the requirement to employ a bevy of bookkeepers to keep track of numerous small charges, reduces the tendency for each agency to mount its own Arctic expedition, to buy its own equipment, supplies and cold weather gear, and to furnish its own transportation. In many instances, economies can be obtained by several succeeding programs re-using common items of equipment purchased for an earlier project. This method of support also provides a subtle mechanism in the coordination of Arctic research, since the research dollar will have a tendency to go to those proposals which have received authorization for logistical support.

3. Sec. 4 (7) - Coordinate, after consultation with the Secretary of State and in conjunction with his offices, exchanges of information about the Arctic on an International basis. This type of requirement has stymied numerous attempts by agencies to promote an Arctic science policy for the past quarter of a century. It is recommended that this paragraph be omitted, that the United States adopt a program of supporting research in the Arctic, and that State Department involvement only be at that Department's pleasure.

While the above suggestions and comments address the Bill as written, they do not lessen my enthusiastic support for the Bill with only minor modifications.

It has been a general truism for the last several decades that either the field research was accomplished prior to the decision concerning a major development in the Arctic or that the development went ahead on a trial and error basis without the benefit of field research. Thus, the CANOL pipeline, the ALCAN Highway, the early exploration of Naval Petroleum Reserve No. 4, and the early oil exploration in the Prudhoe Bay area were conducted on a "full speed ahead, damn the torpedos" basis. By contrast, the construction of the DEWLine, the developmental phase of the Prudhoe Bay field, the construction of the Alyeska oil pipeline, and the most recent oil exploration program on the National Petroleum Reserve in Alaska benefited greatly from research that had been accomplished by others in earlier years. These benefits encompassed improved construction and operational practices, improved environmental protection, and substantial cost savings. Much of the information was obtained from research that had been accomplished at the NARL.

While the above examples are history, it would appear that development in the United States area of the Arctic will continue. However, the types of basic and applied research that proved valuable to the above mentioned programs has virtually been discontinued during the past several years. Thus, the decision makers, the regulatory agencies and industry, in general, are faced with embarking on developmental programs without the benefit of the scientific data that could be most helpful, or mounting very expensive "quickie" studies which

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may or may not produce information having general validity. Some examples where scientific information is needed are:

1. Ice and current conditions in the Beaufort Sea beyond the protected bays and lagoons.

2. Ice conditions in the North Alaskan Coastal (or Bering Sea) current (not Chukchi Sea current) that traverses the proposed Chukchi oil lease area. The ice in this area is much different from the ice found in the Beaufort Sea area of economic interest.

3. Distribution, characteristics, and thickness of permafrost, including subsea permafrost, and permafrost features.

4. Geophysical characteristics of permafrost and the deeper rock units.

5. Construction material and water supply problems in the southwestern one-half of the National Petroleum Reserve in Alaska.

6. Nearshore and "coming-ashore" construction problems for pipelines along both the Beaufort and Chukchi Sea coasts.

7. Water supply and, in some areas, gravel supply problems, as well as staging areas, in the coastal area of the Arctic National Wildlife Range.

8. Construction techniques in the absence of gravel for use as a construction material (much of the Arctic Slope of Alaska).

9. Communications and their unique characteristics in the Arctic region.

10. Biological research in the coastal and shelf areas of the Beaufort and Chukchi (North Alaskan Current) Seas. The well-publicized controversies, and the amount of erroneous information ensuing, concerning the whales and the ringed seals provides convincing evidence for the need for research in these and related subjects. If it is not accomplished, recent history would suggest an outcome of numerous instances of overregulation, some needless denials of entry into potentially rich resource areas, instances of inadequate protection of the environment, and greatly increased costs of exploration, development, and transportation. These greatly increased costs would result in a markedly decreased tax-take by the Federal, and sometimes the state and local governments, far exceeding the cost of even a generously funded research program.

11. Distribution and life cycle characteristics of wildlife, especially reproduction, feeding and reaction to human activity.

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12. Wetlands, the unique problems posed by their definitions in permafrost terrain.

13. Fisheries research, both basic and applied, in the lakes and streams in northern Alaska and in the nearshore areas. Again, the well-publicized controversies concerning this subject provides evidence for the need for research in this discipline.

14. Presence and characteristics of cultural features, especially archeological sites.

15. Short- and long-range effects of vehicle traffic over tundra, both moist and dry, areas.

Many other examples could be cited. Also, there probably is a belief that a considerable amount of research has been accomplished in these areas already. Appearances, however, may be somewhat deceiving since short, generally summertime only, ad hoc studies by people not already generally familiar with the Arctic environment tend not to be overly productive in adding to the store of scientific knowledge.

Major industry can, and will, conduct some applied research, as they have done in the case of nearshore, generally shore-fast sea ice near Prudhoe Bay and in the Canadian Archipelago. These results, however, tend to have a very specific and limited orientation, often are proprietary and, thus, are generally unavailable to other companies, to the Government, or to the citizens. Thus, if the research is going to be accomplished, the Government, in self defense, is caught with the major portion of the chore.

A reasonably well-equipped base, in which to conduct experiments and from which to operate, is required to accomplish sophisticated, in-depth, and long-term research. The Naval Arctic Research Laboratory possesses these facilities and, in some respects, has laboratory facilities superior to those found on many college campuses. In addition to the existing facilities, the NARL is well located, especially for research relating to the seas. To the northwest lies the Chukchi Sea with one of the greatest expanses of continental shelf in the world, a counterclockwise ocean current gyre, and a relatively thin jumble of seasonal ice in winter. To the northeast lies the Beaufort Sea with a relatively narrow continental shelf, a billiard table flat ocean deep (12,000 feet), a clockwise ocean current gyre, and heavy polar pack ice. The NARL also is centrally located for support of land-based research in Arctic Alaska having, in its heyday, supported research westward to the Bering Sea, eastward to the Canadian border and beyond to Banks Island, and inland well into the Brooks Range. In providing the support of research the NARL also constructed 10 year-round inland field stations, to operate as required for research, and established and operated, over the years, a total of 10 scientific stations on the Arctic ice pack.

Some aspects of research are amenable to quick, ad hoc studies that can be accomplished from spartan-type field camps. Few in-depth research studies,

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especially environmental studies, fit that category. Also, ad hoc studies seldom provide for a continuity of research, for much in the way of interdisciplinary transfer of knowledge, and often are very expensive from the logistics standpoint. Good examples of these problems were encountered by the 105(c) studies (P.L. 94-258) and the Beaufort Sea environmental studies which cost many millions of Federal dollars.

A further consideration in the support of research in Arctic Alaska is a stable work force which has a knowledge of Arctic conditions and an interest in research accomplishment. The community of Barrow provided much of the NARL work force who contributed much of the background knowledge required by field scientists for efficient accomplishment of their tasks. One of those assistants is now the Mayor of the North Slope Borough; another is now the President of the Arctic Slope Regional Corporation.

I strongly support the efforts being made by the authors of Senate Bill No. 1562 to provide a comprehensive national policy dealing with the national needs and objectives in the Arctic. I believe that a permanent laboratory base is required. Furthermore, I believe that the Naval Arctic Research Laboratory, renamed the National Arctic Research Laboratory, would provide the most logical permanent base in which, and from which, to operate.

A copy of the comments I provided concerning the Draft Report on U. S. Arctic Research Policy and the Possible Roles of the Naval Arctic Research Laboratory is appended.

Max C Brewer

Max C. Brewer
3819 Locarno Drive
Anchorage, Alaska 99504

7 April 1982

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3819 Locarno Drive
Anchorage, Alaska 99504

30 November 1981

Dr. David Rickert
U.S. Geological Survey
409 National Center
Reston, Virginia 22092

Dear Dr. Rickert:

Although I was invited to respond officially concerning the Draft Report on U.S. Arctic Research Policy and the Possible Roles of the Naval Arctic Research Laboratory, I believe that it might be more helpful were I to respond in my role as a former director of the NARL. As for background, I was engaged in snow, ice and permafrost research at the NARL during the period 1950-1956, director of the NARL from 1956 to 1971, and during the past 10 years have visited the NARL many times and in several capacities. I was in residence at the NARL from September 1950 until July 1971, except for a portion of the years 1955 and 1956.

The Study Committee, under a very short time constraint, has accomplished a good job of assembling information about the NARL and of the role that the NARL has played in furthering research in the Arctic. They have not been able to do as well regarding assembling information about the United States' Arctic Policy, partially because the United States has never had one, other than that of generally benign neglect. This has occurred in spite of National Security Decision Memoranda 144 and 202 and in spite of policy papers regarding the subject prepared by numerous agencies during the last 20 years. The Committee also has, in reality, by-passed a portion of the mandate in Section 1007(a), i.e., "The study shall specifically address and the Secretary shall make recommendations on the need for redirecting the United States Arctic research policy ....." (emphasis added). A "policy-guided" Arctic Research program, or objectives, as used in the report can only be considered to be a proposed program and, thus, cannot really fulfill the mandate required by Section 1007(a).

Four other general short-comings were noted in the report. First the Committee several times noted the fiscal constraints regarding the Federal budget in their discussion of policy and the possible role of the NARL. This brings into question, especially as regards policy, whether there may have been some bias in the discussion of the research requirements and goals. Budgets and budgetary constraints should be political decisions, to come into play after a policy is developed and recommended and during the process of implementation. This would appear to be true whether the policy was implemented or whether the implementation was delayed, because of budgetary or other constraints, for many years.

Secondly, the Federal Questionaire could have been worded in a manner that might have better provided the desired information. For example, in question (b) how can a project presently be using the NARL facilities if the NARL is closed as far as research is concerned? In question (d) how can one evaluate the impact of the closure of the NARL on one's research, if the NARL is already closed and one has no research going on there or any plans for research there due to the announced closure? Whereas, questions (b) and (d) might not provide good information, question (e) might be expected to bring forth biased or even erroneous information. Few agencies like to have other agencies expend the former's money; further a long-term commitment for such an expenditure (partial funding) probably would be viewed as inviting the Congress to cut the existing agencies' budgets and to appropriate those funds directly to the operating agency. Representatives of several agencies, both Federal and State, candidly informed me of this reaction to suggestions of partial funding when I was Director of the NARL. The National Science Foundation was one of those agencies.

Another general short-coming is the lack of an in-depth analysis as to why a great deal of both basic and mission oriented research could be accomplished at the NARL, and the Laboratory's physical plant could grow, during the 1960s and early 1970s, but only a meager amount of research and no growth was accomplished in the late 1970s in spite of increasing budgets at the NARL. A partial answer may well be that in the 1960s the NARL was actually operated more as a National laboratory (only about 30-35 percent of the research was Navy sponsored). Furthermore, it had a small cadre of administrators, a much larger cadre of service personnel, and fell under the direct purview of a Navy scientific officer in Washington who was a recognized scientist. This changed in the early 1970s, due to the Navy's desire to have a stronger Naval presence. The Navy assumed a far greater day-to-day operational role at the NARL, the numbers of the administrative staff grew, the numbers of service staff decreased markedly, the scientists started paying more and more for less and less service, and the overall Navy purview of the research passed from scientific direction to direction by contract administrators. As was noted by many respondees to the Federal Questionnaire, the NARL literally priced itself out of the market it was meant to serve. This particular analysis is badly needed in the report as options No. 1 and No. 2 proceed down pretty much that same discredited path with an even larger bureaucracy apparently being envisioned.

A very important general short-coming in the report concerns the very limited discussion concerning research associated with the human environment and human engineering, with cultural values, with social change, and with Native fears and governmental credibility. The unnecessary annual costs incurred by the Federal Government because of just these last two subjects is believed to far exceed the annual cost estimated for the most costly of the options presented in the report. In order to accomplish the type of research envisioned in these areas of endeavor it is vital that Native assistants be actively involved in the research and in the service staff supporting that research; or that, when qualified, they be principal investigators on research projects. This participation by long-term residents also provides the continuity in the information transfer process for succeeding research programs and for the local residents.

Arctic Policy

Congress has stated, in Section 1007(b), that the United States needs an Arctic research policy. The Congress also, in the same paragraph, has provided general,but encompassing, guidelines concerning much of the content of that policy. The National Security Council, in Memorandum 202, has stated that the United States will support the sound and rational development of the Arctic guided by the principle of minimizing any adverse effects to the environment. Many of the agencies and many members from academic circles at one time or another also have voiced strong support for developing an Arctic research policy.

With all the support for developing a policy for United States research in the Arctic it, thus, appears strange that 20 years of effort by agencies and their consultants has failed to produce an Arctic policy. The problem appears to be in the coupling of an "Arctic research policy" and "international cooperation" in the Arctic. A suggested solution to break the bottleneck is for the United States to develop a policy for scientific research in the Arctic and get on with the business of needed research and to let the diplomats determine if, when, and to what degree international coordination of that research might be desirable.

Does The United States Have A Need For Research In Arctic Areas?

It has been a general truism for the last several decades that either the field research was accomplished prior to the decision concerning a major development in the Arctic or that the development went ahead on a trial and error basis without the benefit of field research. Thus, the CANOL pipeline, the ALCAN Highway, the early exploration of Naval Petroleum Reserve No. 4, and the early oil exploration in the Prudhoe Bay area were conducted on a "full speed ahead damn the torpedos" basis. By contrast, the construction of the DEWLine, the developmental phase of the Prudhoe Bay field, the construction of the Alyeska oil pipeline, and the most recent oil exploration program on the National Petroleum Reserve in Alaska benefited greatly from research that had been accomplished by others in earlier years. These benefits encompassed improved construction and operational practices, improved environmental protection, and substantial cost savings. Much of the information was obtained from research that had been accomplished at the NARL.

While the above examples are history it would appear that development in the United States area of the Arctic will continue. However, the types of basic and applied research that proved valuable to the above mentioned programs has virtually been discontinued during the past several years.

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Thus, the decision makers, the regulatory agencies and industry, in general, are faced with embarking on developmental programs without the benefit of the scientific data that could be most helpful. Some examples where scientific information is needed are:

1. Ice and current conditions in the Beaufort Sea beyond the protected bays and lagoons.

2. Ice conditions in the North Alaskan Coastal (or Bering Sea) current (not Chukchi Sea current) that traverses the proposed Chukchi oil lease area. The ice in this area is much different from the ice found in the Beaufort Sea area of economic interest.

3. Construction material and water supply problems in the southwestern one-half of the National Petroleum Reserve in Alaska.

4. Nearshore and "coming-ashore" construction problems for pipelines along both the Beaufort and Chukchi Sea coasts.

5. Water supply and, in some areas, gravel supply problems in the coastal area of the Arctic National Wildlife Range.

6. Construction techniques in the absence of gravel for use as a construction material (much of the Arctic Slope of Alaska).

7. Biological research in the coastal and shelf areas of the Beaufort and Chukchi (North Alaskan Current) Seas. The well-publicized controversies, and the amount of erroneous information ensuing, concerning the whales and the ringed seals provides convincing evidence for the need for research in these and related subjects. If it is not accomplished recent history would suggest an outcome of numerous instances of overregulation, some needless denials of entry into potentially rich resource areas, instances of inadequate protection of the environment, and greatly increased costs of exploration, development, and transportation. These greatly increased costs would result in a markedly decreased tax-take by the Federal and sometimes the State and local governments, far exceeding the cost of even a generously funded research program.

8. Fisheries research, both basic and applied, in the lakes and streams in northern Alaska and in the nearshore areas. Again, the well-publicized controversies concerning this subject provides evidence for the need for research in this discipline.

Other examples could be cited. Also, there probably is a belief that a considerable amount of research has been accomplished in these areas already. Appearances, however, may be somewhat deceiving since short, generally summertime only, ad hoc studies by people not already generally familiar with the Arctic environment tend not to be overly productive in adding to the store of scientific knowledge.

Major industry can, and will, conduct some applied research, as they have done in the case of nearshore, generally shore-fast sea ice. These results, however, tend to have a very specific and limited orientation, often are proprietary and, thus, are generally unavailable to other companies, to the Government, or to the citizens. Thus, if the research is going to be accomplished, the Government, in self defense, is caught with the major portion of the chore.

Does The NARL Provide An Optimally Desirable Base From Which To Conduct Research In The Arctic?

There are four existing potential research and support of research bases in the Alaskan Arctic: (1) Prudhoe Bay, (2) Lonely, (3) Barrow, and (4) the NARL. Some of the advantages, and disadvantages of each of the locations, are listed below:

	Prudhoe Bay	Lonely Camp	City of Barrow	NARL
1. Existing laboratory facilites from which to accomplish sophisticated or in-depth research.	No	No	Minimal	Yes
2. Fuel, at reasonable cost, for heat and power. (This is an extremely important cost factor in Arctic areas).	No	No	Yes	Yes
3. Existing shops, conveniently located, and other service facilities, including protected storage for field equipment in the "off season."	No	No	Minimal	Yes
4. Existing hangar to provide for repair, maintenance and storage of aircraft needed for overice and inland research.	No	Yes	No	Yes
5. Convenient and protected float aircraft landing body of water, or for ski-equipped aircraft in winter.	Probably (2-3 miles)	No	Yes (3 miles)	Yes (0.5 mile)
6. Utilities (power, steam, water, sewage disposal, telephone, all-season airstrip).	Hotel-type, very expensive	Yes	Fair	Yes

		Prudhoe Bay	Lonely Camp	City of Barrow	NARL
7.	All-season road system	Connects with Fairbanks	No	30 miles	30 miles
	(a) Restrictions on use.	Yes	--	No	No
8.	Generally unrestricted access to inland areas (with proper equipment)	No	Yes	Yes	Yes
9.	Unlimited access to bay and lagoon areas.	No	Yes	Yes	Yes
10.	Reasonable access to Beaufort Sea area.	Yes	Yes	Yes	Yes
11.	Reasonable access to Chukchi Sea area with its extensive continental shelf area.	No	No	Yes	Yes
12.	Nearby access to a riverine area.	Yes	Fair	Fair	Fair
13.	Established field stations in different areas with differing environmental settings.	No	No	No	Yes
14.	Good location from which to study marine mammals, particularly whales.	No	No	Yes	Yes
15.	Good location from which to study land mammals.	Good	Good	Fair	Fair
16.	Good location from which to study waterfowl and migrations.	Good	Fair	Fair	Fair
17.	Existing environmental base of knowledge upon which to build.	Fair	Poor	Fair	Good

	Prudhoe Bay	Lonely Camp	City of Barrow	NARL
18. Local resident population from which to draw long-term employees.	No	No	Yes	Yes
19. Local commercial infrastructure.	No	No	Yes	Yes
20. Daily commercial air service to central Alaska and points southward.	Yes	No	Yes	Yes

Some aspects of research are amenable to quick, ad hoc studies that can be accomplished from spartan-type field camps. Few in-depth research studies, especially environmental studies, fit that category. Also, ad hoc studies seldom provide for a continuity of research, for much in the way of interdisciplinary transfer of knowledge, and often are very expensive from the logistics standpoint. Good examples of these problems were encountered by the 105(c) studies (P.L. 94-258) and the Beaufort Sea environmental studies which cost many millions of Federal dollars. Thus, to accomplish sophisticated, in-depth, and long-term research requires a permanent, reasonably well-equipped base in which to conduct experiments and from which to operate.

Management of the NARL

The further that one gets away from the sources of supply, the greater the control that exists in the hands of the manager who controls the facilities, the equipment, and the supplies needed for the accomplishement of work, including research. This is particularly true in Arctic areas. Also, although one can lead a horse to water or dump the responsibility for operating a laboratory on a reluctant agency, one can not necessarily make the horse drink or the agency properly operate a laboratory. The Draft Report does not appear to reflect an appreciation for these ideas as, otherwise, the options quoted for the various types of management might have been quite different. It is believed that such also would have been the case had an in-depth analysis been made as to why a great deal of research could be accomplished at the NARL for reasonable cost in the 1960s and early 1970s but little accomplished in recent years in spite of what actually were increasing budgets. The in-depth analysis might also have surfaced the need for a scientific control/operation of the NARL, rather than control by facilities maintenance personnel wherein scientific accomplishment received only a secondary, or lower, priority.

This reviewer cannot recommend any of the four options presented in the Draft Report. Options No. 1 and No. 2 would mandate systems even more bureaucratic and unwieldy than the increasing bureaucracy that has brought research activity at the NARL to its present unhappy state. References to this potential are contained in the attached article, "Arctic Research: For What Purpose and for What End?," published in September 1973. Option No. 3 leaves in limbo the responsibility for funding an Arctic Research program, assigns management responsibility to an agency which is reluctant to assume that responsibility, basically makes the NARL an in-house NOAA laboratory, and essentially puts NOAA into a dollar scrounging position as regards the NARL. The net aspect would be that the bookkeepers, rather than scientists, would manage and operate the laboratory; the same system, with just a different agency involved, that in recent years has brought Arctic research to its present unacceptable status. Option No. 4 is not in concert with the Administration's announced intent to develop resources in the United States' area of the Arctic, is not in conformance with NSDM Memoranda 144 and 202, and it is not in the interest of a nation that wishes to maintain an operational capability in the Arctic. In the latter instance it is noted that the Arctic is the one place in the world where it is possible for a knowledgeable operator to have both surface (ice platforms) and subsurface operations occur in concert. A more detailed discussion of the proposed options follows.

1. Option No. 1. This option would have a subcommittee of the Interagency Arctic Policy Group providing policy guidance for the program including direction of the laboratory. A Federal Arctic Research Commission, without a Federal representative, would provide broad oversight management (i.e. direction) of the laboratory. Day-to-day management (i.e. direction) would be contracted to a university or university consortium. And finally, there would be a laboratory director, who would physically control the logistical wherewithal needed to accomplish research in a remote area. The problems with this scheme, in addition to the proliferation of committee-type arrangements are that:

   (a) If the Interagency Arctic Policy Group is going to maintain an interest they will want to call the shots regarding major laboratory decisions.

   (b) But the Commission also will want to make the major laboratory decisions since they have no other reason for existing. Thus, they would tend to be at loggerheads with an active Interagency group.

   (c) However, once a contract is signed with a university or university consortium it (they, i.e., another committee) will actually be making the major operational decisions for the lifetime of that contract, unless they just roll over and play dead and let their director report directly to the Commission which is highly unlikely. It should be noted that, in government contracting, the government tells the contractor what to do, but generally does not detail how he does it. These details are extremely important in the support of research, especially in a remote area such as the Arctic. Also, except in rare cases, this control by one university, with in-house research, could bring complaints of favoritism as regards support given to other projects.

(d) But the director, who is actually on site, who has the physical wherewithal under his control, and who is dealing directly with the scientists, basically controls the operation.

The tremendous bureaucracy envisioned in this option would defeat the efforts of even well-intended people, would be very unwieldy for any timely response to unforeseen circumstances, especially in an area where some seasons are very short, and administratively would be very costly.

The charging of user fees is questioned because, unless it is a flat fee for only board and room, it would require a very considerable increase in the administrative staff to fairly determine the costs. Also, there would always be a tendency to try to increase the user charges in order to take care of budgetary short-falls, perhaps even to enhance the support of the in-house research. This has been the history of the NARL operation in recent years and in the process they have priced themselves out of the market.

2. Option No. 2. This option would insert the National Science Foundation in place of the proposed Arctic Research Commission. With little else changed from Option No. 1, other than the dropping of the in-house research program, the comments under Option No. 1, regarding the unwieldy bureaucracy apply. In addition, this reviewer has two other comments.

   (a) The NSF has been quoted as not wanting to have the responsibility for operating the NARL, and, thus, must be considered to be an agency reluctant to having the NARL dumped on them. Also, the NSF has not been known to be much of a promoter of research in the Arctic during the past 20 years.

   (b) What incentive would another Federal mission agency, or a university or university consortium, have for wanting to run a remote logistics only base of operations. This type of contracting certainly is not what most Federal agencies or universities are chartered for and for which they generally have developed much in-house expertise.

3. Option No. 3. This option leaves in limbo the responsibility for funding an Arctic Research program and would, in effect, reduce the NARL pretty much to the status of being a NOAA field station. The latter is made quite evident through the various comments about prorating costs. Not

only would this require the employemnt of a bevy of bookkeepers, but it would also price research at the NARL out of business. In that regard it contains the same ills that have afflicted the NARL in recent years. The only benefit offered under this option is that the mandated bureaucracy in Options No. 1 and No. 2 is somewhat reduced. Other problems with Option No. 3 are:

(a) What happens to Arctic research should NOAA decide that it has completed its present research in the Arctic two years hence, i.e., a situation similar to that presently faced by the Navy?

(b) Should, or could, NOAA be expected to industriously promote (before the Congress) research or research programs in which it has no interest, or be happy about being saddled with a logistics operation were they to have no ongoing work? In other words, this option takes care of NOAA's immediate needs, but really side steps the question of research in the Arctic.

(c) Since the Arctic research conducted by many universities is supported by Federal and State agencies, would those projects pay 20 to 25 percent of prorated costs or 100 percent of prorated costs? The option appears to be unclear in this regard.

(d) Who would determine fair and equitable prorated costs? Many agencies have objected to this type of procedure in the past on the basis of fairness and their inability to properly budget under that type of provision.

(e) Would other agencies accept this approach and would they accept the idea of Native projects being treated differently, as regards charges? Would the Native groups be inclined to consider that, since they only paid for a fraction of their actual costs, they were only getting a fraction of the support deserved?

4. Option No. 4. This option reduces support of, and, hence, accomplishment of, research in the Arctic to very expensive, "quick and dirty" independent forays into the field with each project bearing the expensive costs of mobilizing and demobilizing logistics. It appears to be inconsistent with the mandate in Section 1007 and with intents of NSDM Memoranda 144 and 202.

After being critical of the options presented in the Draft Report, this reviewer believes that an alternative option should be suggested, Thus,

Proposed Option No. 5.

1. Change the name of the Naval Arctic Research Laboratory to National Arctic Research Laboratory.

2. Create a Federal Arctic Research Commission which, in concert with an Advisory Board composed of members from agencies with interests in the Arctic, the State, the North Slope Borough, and industry, would develop- and guide a program for research in the Arctic. The Commission would be responsible for:

   (a) Obtaining funding for the operation of the laboratory, including a modest amount of in-house research, from the Congress and from the State of Alaska.

   (b) Developing guidelines for a research program in the Arctic, reviewing proposals received and soliciting proposals for accomplishing research, and approving those proposals for which support at, and by the laboratory, is to be provided. The proposals to be supported could be from agencies, from universities both domestic and foreign, from individuals, or from industry. Whereas, it is not practical for the Commission to attempt to coordinate research in the Arctic, it could provide a coordinated program for research at the National ARL through determining which projects would be supported there.

   (c) Providing research grants to scientists from universities, both domestic and foreign, and to qualified individuals to conduct research at or from the NARL. Such grants need not be provided to Federal or State agencies since, if those agencies deemed some item of research to be needed, they should be willing to fund it.

   (d) Employing a director for the NARL. Such employment initially should be understood to be for a period of three years, certainly not less than two years, but contingent on the continued pleasure of the Commission. The candidates to be considered should have scientific training, at least modest peer recognition for research in their scientific discipline, and desirably some previous Arctic experience. The director would develop criteria for and would employ all staff, including those to be engaged for in-house research. However, the Commission would retain concurrent approval on candidates for the positions of Associate Director and all senior in-house research personnel, including the research programs proposed by those personnel. The NARL staff, including the director would not be employed under the Federal classification system nor be limited by the conditions under that system.

   (e) Employing such administrative staff as the Commission may deem to be necessary and appropriate to accomplish the Commission's mandated functions.

   (f) Assuming ownership, for the Government, of the NARL and the associated properties and equipment and the providing for required capital improvements and operational maintenance of all real properties involved.

3. The NARL administration would be responsible for:

(a) Employing all NARL staff, including a modest number of in-house senior scientists to accomplish research in disciplines neglected by (1) agency, university, and individual proposers, in order to provide a balanced and coordinated research effort; (2) to accomplish mission oriented research; and (3) to provide scientific continuity at the NARL and a core of scientific advisors to incoming scientists. To the greatest extent possible, without prejudicing the quality of the research effort, Natives resident in the area would be employed.

(b) Developing a program providing for employee benefits consistent with those normally accepted for a remote duty station. These benefits would include an actuarially sound retirement system.

(c) Providing suggestions to the Commission concerning additional research that should be accomplished in the Arctic.

(d) Developing, procuring, and maintaining stocks of scientific supplies and equipment common to projects in numerous scientific disciplines. These supplies should include specialized cold weather clothing and camping field gear. Unusual, prototype, or project-oriented equipment would be the responsibility of the individual project.

(e) Rehabilitating the 10 scientific field camps listed in the Draft Report, plus the NARL existing scientific station at Lake Peters (in order to provide a alpine-type research environment), and establishing new field stations as required, including temporary stations on the Arctic ice pack should such be required.

(f) Procuring and providing suitable on-road and off-road ground transportation, and small boat transportation for use in the support of scientific research projects. It is recommended that the light aircraft and small boats be laboratory owned and operated in order to provide a continuity of experience, flexibility and timeliness in operations, and added safety, i.e., long-time experienced bush pilots and boat operators.

(g) Providing local Native field assistant help to projects where such assistance would enhance the scientific productivity of the project or provide added personal safety for the researcher(s) conducting the scientific research.

(h) Providing and maintaining an Arctic-oriented technical research library, and providing technical information regarding on-going research in the Arctic to agencies, universities and the public.

(i) Providing messing, billeting, and custodial service for all visiting scientists and for all staff not having a local domicile.

(j) Providing for the repair, maintenance and modification, where necessary, of the existing NARL physical plant and any additions that may be made thereto.

4. All the NARL support listed under item (3) would be at no charge to the agency or university conducting Government-sponsored and Commission-approved research at the NARL. The agency or university would, however, be responsible for providing the salary and other costs for their investigators and for providing their transportation between their home duty station and the NARL. In the case of industry-sponsored research wherein the Government should not give taxpayer's resources away, the projects would be provided the same services listed under item (3) but they would be charged a flat per manday fee. That fee, however, should not be so high as to discourage research. Thus, and in order to allow for inflation, the manday fee recommended would be identical to the Government-approved existing per diem rate for Barrow.

It is believed that, with the economies obtained by reducing the bureaucracies proposed in the options in the Draft Report, a very worthwhile program of research in the Arctic, operating from the NARL, could be accomplished for between $10 and $11 million per year in 1981 dollars. The program would include a modest in-house research program and a significant and viable grants program.

I apologize for the delay in providing this review but I believed that my review, to be helpful in your study, should be somewhat detailed as well as being specific in content.

Sincerely,

Max C Brewer

Max C. Brewer

Enclosure

(Proceedings of the 25th Anniversary Celebration of the Naval Arctic Research Laboratory, August 14, 1972. Published September 1973, Arctic Institute of North America Technical Paper No. 25)

ARCTIC RESEARCH: FOR WHAT PURPOSE AND FOR WHAT END?

Max C. Brewer

Commissioner
Department of Environmental Conservation
Juneau, Alaska

Anniversary celebrations provide the opportunity to join with old friends, colleagues, peers, and neighbors to review past events, to crow a bit about successes, to lament the missed opportunities, and hopefully to plan for an even greater future. Today, we are celebrating the silver anniversary of NARL (or ARL as many of us still remember it). Silver anniversaries are always special junctures in our lives, whether for a quarter century of marriage or for the research life of an institution.

I like to think that NARL has much to crow about on its silver anniversary. Twenty-five years ago it started most humbly, as aptly shown by the picture of Dr. Laurence Irving's pioneering group posed in front of its extremely modest laboratory. Twenty-five years later NARL has gained international recognition for the work that has emanated from the efforts of its researchers. Additionally, and what is of far greater importance, the results of their efforts have provided the background data and reasoning for numerous decisions at both the state and national levels.

As in the case of the government's space program, there also has been a spinoff of results into the private sector. Even as benefits continue to accrue, research at NARL is both increasing in scope and expanding in depth. Perhaps it might be of interest to examine why this is so when there has been a marked trend for research programs and institutions such as NARL to fade away, to become technical institutions, or at least to reach advanced middle age by the time of their silver anniversary.

Despite the vast amount of work done in the Arctic in recent years, it still remains largely an unknown environment to the general public. Because it is unknown, it retains a certain romantic interest for many people. But, because of man's appetite for raw materials and because of the potential for finding these raw materials in the Arctic, there exist national and international pressures for exploring the Arctic, for developing methods of economically retrieving the raw materials to be found there, and for finding better ways to live and work in its harsh environment. Thus, the circumstances existed and continue to exist for a research laboratory to grow with continuing vitality, provided it is properly organized to escape the doldrums of old age, often symbolized by repeated reorganization or contentment with past accomplishments.

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In my opinion, NARL was properly organized to escape the pitfalls of old age and liquidation. It was established in 1947 for the support of arctic research without restrictive definition or programing as to what research would be conducted or how it would be supported. Therein lies the strength and continuing vitality of NARL. Had NARL been organized for the support of lemming research on the North Slope, it would have been dead long ago; had it been organized for the support of geological studies, it would have died in 1953; had it been organized for the support of permafrost studies, it would not have been organized by the Navy because they thought they already had their answers prior to 1950, not anticipating the problems of 1970; had it been organized for the support of ice studies, it probably would not have been created until the *Manhattan* tanker experiment and might have faded almost as rapidly; had it been organized for the support of auroral studies, it would likely have had the same limited life that the National Bureau of Standards' auroral station at Barrow experienced; had it been organized for the support of micrometeorological studies, it would long ago have been absorbed into the National Weather Service and operated by a technician; had it been organized for the support of naval communications, the Navy need might have evaporated before the facility was completed.

The operational task for NARL, in retrospect, really boiled down to one of supporting broad environmental research in a particular area–the Arctic–20 years before the word environment became a household word. Yet NARL still has the resilience to continue on after people could become tired of the word environment, and it will keep on growing so long as someone does not change its task by inserting the word "environment." The flexibility of NARL's programs has allowed modification with changing times, including those involving social environment, political environment, fiscal environment, and occasionally the biological and physical environments. The programs have tended to retain freedom from mission orientation, with the often ensuing prejudiced results and blinders as regards associated impingements from other aspects of the environment. Innovation in research has been encouraged rather than impeded, as often happens in the bureaucracy inherent in many well-organized programs. At the same time coordination of projects for balance has brought together complementary studies in such a way as to insure a large amount of interaction and critical examination of the results. This has tended to keep the scientific investigators from getting hung up on the swords of their own ignorance and has provided for quality scientific results.

The quality results and the nonmission orientation of the program are the assets that allowed NARL to develop its national and international reputation while at the same time providing information of much value to Department of Defense missions and to other national interests. For example, Dr. George MacGinitie, the second director of NARL, was not seeking submarine canyons for the *Nautilus* to enter the Arctic Basin when he discovered the Barrow Sea Canyon in 1949 while using an old dory to collect marine specimens. Also, Dr. MacGinitie was not thinking about ice islands when he photographed and described, from the ice, a part of what is now believed to have been Ice Island T-3 off the coast northeast of Barrow in the spring of 1950.

The Navy thought it would have no need for further studies of permafrost in 1950 when it agreed to continue the support of a U.S. Geological Survey permafrost project. A few years later, however, a Canadian government representative credited the Navy for this NARL-supported permafrost project by stating that it had saved the U.S. Air Force far more during construction of the DEW Line than had ever been spent on the NARL from its inception until that time. The sea ice study, begun in 1957, provided information and training for the designer of monopods and other supports used for oil well platforms in Cook Inlet. These studies, coupled with results from some of the permafrost information obtained near Barrow, have formed the basis for several tentative designs for offshore oilfield platforms along the north Alaskan coast.

The results from an earth heat-flow study in northern Alaska provided the differentiation of parameters needed for earth heat-flow studies undertaken in areas ranging from the depths of the Arctic Basin to the southern 48 states, in Iceland, in Turkey, and in other parts of the world. In this regard, the Arctic often has been found to provide a less complex area for study, from which can be developed the basic parameters in both biological and physical studies for application to more complex studies in the southern latitudes.

Admittedly, the United States is facing an energy crisis, and the North Slope oil and natural gas reserves offer a partial solution. The problems of permafrost and tundra, which basically boil down to a problem of erosion, have been identified as two of the major obstacles in bringing this energy source to market. In the solution of these problems, the results from NARL-sponsored projects have been heavily utilized. In addition, many of the men trained at NARL over the past two decades are either directing or participating in additional research for industry. Such efforts extend into resolution of many other environmental problems for industry, the construction of facilities, and the solution of logistic difficulties.

Information obtained at NARL has aided in solving communication problems for all branches of government and industry in northern latitudes. In fact, NARL has even provided information for the Apollo missions. Little known is the fact that, of the dozen significant northings of surface vessels since 1849, five have occurred during the establishment and support of ice stations operated by NARL. During one such support operation, an icebreaker reached 79°30′ North by following a zone of weakness in the ice between two major ocean currents in the Arctic Basin. The same information used in this endeavor also was used by the Wally Herbert expedition in its successful dog team trek from Barrow to Spitsbergen by way of the North Pole.

As a sideline, NARL even trained an environmental commissioner for the State of Alaska. In so doing, it provided him with the insight to understand that the problems of waste disposal in the Arctic and in Harlem, New York were similar and that much of the problem in both cases was rooted in the psychology of impermanence for individuals and agencies in both locations.

Today, the United States has embarked on a housing program for natives in Alaska. Six thousand units are scheduled to be built during the next 5 years. At a conservative estimated cost of $40,000 per unit, the total expenditure would amount to $240 million. The information developed at NARL concerning water supply, sewage disposal, and the use of insulation in arctic structures could save many millions of dollars for this project. Yet, only one NARL project has been aimed at water supply, one at sewage disposal, and part of one at construction of this type of housing.

Many other examples could be cited, but the point is this: The research supported by NARL has provided practical solutions to many problems without ever having been pointed toward the solution of these problems or having such solutions as the goal. The search has been for knowledge of the environment and of man's interaction with the environment, not a narrow search for data to prove preconceived notions or expectations, although there have been exceptions.

For the most part, NARL-supported contract research has attracted topnotch, talented investigators who have not always been able to make a more or less permanent commitment to either living or working in the Arctic. In so doing, NARL has tended to escape the entrenched bureaucracy that inevitably results in any organization, be it government or private. Such bureaucracies tend to drift toward a concentration on facilities, toward a concentration in developing personal comforts, toward a concentration for protocol whereby one does only those things that apply to his immediate job.

In the northern and/or remote stations, this tends to concentrate people's time toward providing such auxiliary services as commissaries, nurseries, private car plug-ins for winter use, and other comforts of a bureaucratic heirarchy. Not only does this dilute the scientific effort, but also it can, in time, push up costs (particularly in a logistically difficult area) to such fantastic figures that research is priced out of the market. In addition, it can so entrench a group that research suffers badly, sometimes actually changing from a status of scientific research to one of technical data gathering.

NARL has supported a quarter century of lean and hungry investigators, and independent and generally unfettered scientific research. The quality of the research has attracted an international reputation to the Laboratory. The results have so thoroughly interfaced with the various disciplines that the picture has often been complete and the results have had wide application to many government and private projects. The unplanned-for results have saved millions of dollars and have often seen surprisingly early practical application.

Arctic research: for what purpose? We might say to increase man's knowledge and economical use of arctic areas for his welfare, without destroying or unduly wasting its resources. Often, because of cost or remoteness, the benefits accrue to the government.

Arctic research: for what end? We can only speculate on this by using other areas and other research laboratories and their operations as a guide. We do know, however, that our knowledge of arctic areas is still meager and that our understanding of the environmental interplay and of man's influence on this interplay is just beginning to be developed. We also can speculate that lean and hungry investigators combined with independent and unfettered scientific research that is balanced in disciplinary approach and priority will maintain and enhance the scientific and nationally useful value of NARL's efforts. We can further speculate that organized, stylized, and bureaucratic operations could lead to more comfortable facilities, to more entrenched personnel, to greater expenditures with lessened quality and quantity of scientific output, and to perhaps the closing of another overaged and outdated laboratory. Hopefully, in 1997, NARL will still be able to crow about its accomplishments of the then past quarter century.

Testimony by Dr. Juan G. Roederer
on behalf of the University of Alaska

U.S. Senate
Committee on Governmental Affairs
Hearing on Bill S.1562 "Arctic Research and Policy Act of 1981".
Fairbanks, April 7, 1982

Mr. Chairman:

The University of Alaska has long recognized the need for the establishment of a National Arctic Research Policy. Therefore it strongly endorses the initiative taken by Senator Murkowski.

As the principal institution of higher learning in Alaska, the University of Alaska specializes in the production of manpower and knowledge needed to solve the complex and highly specific scientific, technological and social problems posed by the expansion of human activities into the Arctic and Subarctic regions. The need for adequate means and mechanisms leading to the timely solution of these problems becomes more and more pressing as our national economy becomes increasingly dependent on the natural resources of Alaska and the adjacent waters, as our national security becomes increasingly dependent on defense systems emplaced in the Arctic, and as native populations become increasingly concerned about the impact of related activities on their lifestyles and traditions.

We have been concerned for years over the lack of a comprehensive statement of United States Arctic research goals and objectives and the absence of effective coordination of Arctic science and technology. Of all countries bordering on the Arctic, the United States is the only one without a coordinated Arctic science policy and without a national institute, laboratory, or any other organization devoted to the sustained planning and support of Arctic research. Responsibility for planning, implementing, and funding Arctic research is divided between several federal agencies, the State of Alaska, and private groups, whose mandates or objectives are separate or unconnected. This often resulted in a boom-bust development of Arctic research where scientific thrusts, mostly short-term and unrelated, have followed one another. Because of the lack of continuity in science support, teams that have achieved scientific advances often disintegrated after completion of their missions, sometimes without complete documentation of their work. Several Arctic research programs were developed and supported as corrective measures only after the appearance of serious technical problems. The over-regulation that often has plagued industrial initiatives in the Arctic is more the result of scientific uncertainty than the result of over-emphasized environmental concerns.

Arctic research bears some very distinctive features which have led to difficulties in implementing effective research plans. Let me list just a few, leaving out the more obvious ones such as high cost and adverse climatic conditions:

1. Because support for Arctic research has been low and sporadic, the pool of scientists and engineers experienced in the study of Arctic problems is small. Since many specialties important in the Arctic are taught at only a few universities, the cadre of trained personnel necessary to the solution of many Arctic problems has not been developed.

2. Many research problems of major importance in the Arctic do not fall logically into existing funding and organizational structures and tend to be ignored because the lines of federal responsibility are not clearly

defined. In particular, since Alaska is the only Arctic state, many Arctic research projects are perceived by federal agencies as being of strictly Alaskan interest and thus are expected to be funded from state sources.

3. Basic site-specific data similar to those collected in other regions over long periods are missing in the Arctic. This lack of continuity makes it difficult to assess the magnitude of long-term environmental changes that may result from developmental activities.

What is needed, Mr. Chairman, is that the Government of the United States make a clear and unequivocal statement of its commitment to the support of scientific research in its Arctic territory and in other areas of the Arctic and Subarctic of specific interest to the United States. This commitment should be an integral part of our national policies for economic, technological and social development, environmental protection, national security and international cooperation. And the commitment should be implemented by specific actions to improve the coordination and effectiveness of Arctic research programs and ensure the continuity, stability, effectiveness, and control of funding of research in Arctic regions.

Mr. Chairman, in the light of these statements I would like to make a few specific comments on the text of Bill S.1562.

First, I would like to express our agreement with all points in the section on Findings and Purpose of the Bill. I respectfully suggest that in that section reference also be made to the potential of strategic minerals in the Arctic Regions; that other regions of United States interest such as Svalbard and the eastern Arctic Ocean also be included; and that more examples of needed basic and applied research be listed.

Second, we believe that the establishment of a small, independent federal commission would have a greater potential for the development and implementation of a policy-guided national Arctic Research Plan than the Arctic Research Council proposed in the current version of the Bill. A congressionally established independent commission, assisted by an advisory committee with experts drawn from public, private and local sectors, would be better-suited to lend guidance to relevant agencies for coordinated efforts to promote cost-effective development of Arctic resources, protect the human and physical environment, and aid the United States defense posture in the Arctic.

Such a commission, independent of mission and funding agencies, could have statutorily granted access to information about the agencies' plans and programs in order for the commission to meet its obligations to maintain a comprehensive overview, report on trends in Arctic research programs and expenditures, and provide necessary policy guidance to the government as a whole. In addition, the commission could coordinate the efforts of federal, state, local, industry, and academic interests in developing and periodically reviewing and revising a coordinated national Arctic Research Plan. The commission could also have financial resources or be empowered to seek financial resources to initiate and support, through grants or contracts, research and study efforts in areas where either a rapid response is needed or long-term stability must be ensured. An example of the type of independent commission envisaged here is the Marine Mammal Commission, established under Title II of the Marine Mammal Protection Act of 1972.

Third, I would caution against adopting a too narrow definition of the term "Arctic" for the purpose of the Bill. A United States Arctic Research Policy should deal with all those high northern-latitude areas of direct interest to the United States in which cold climate, frozen ground, ice-infested waters, and auroral phenomena pose special problems to life, human society, economic development and defense.

Mr. Chairman, I would like to conclude with a few statements on the potential benefits of an Arctic Research Policy to some quite specific areas.

Benefits to the Academic Community

The foundation for all technological development is basic research. The foundation leading to the solution of all practical problems, whether they are of technological, economic, social or military nature, is basic research. The solution of Arctic problems requires massive efforts of basic research.

Such basic research is mainly conducted at universities. A well-designed Arctic Research Policy, with an appropriate mechanism for its implementation, would provide greater opportunities for Arctic-directed university research and assure not only a more adequate but also a more stable level of funding for what often are multi-year university research projects with costly logistics requirements.

But this is not all. I mentioned above that the pool of United States scientists and engineers experienced in the study of Arctic problems is small. These scientists and engineers are produced by universities. A well-designed Arctic Research Policy would help the relevant instructional programs by attracting more talent into the study of Arctic problems through increased opportunities of research for graduate students and their faculty.

Benefits to International Scientific Relations

It is almost ironic for those of us living in the far north that our government has a well-defined, well-coordinated and, within existing budgetary constraints, well-implemented commitment to research in the South Polar regions. As I stated above, we are the only Arctic rim nation that does not have an equivalent well-defined research policy for the north. Of course, there are important differences. In Antarctica there are no indigenous peoples, there is no resource development, and military activities and territorial claims are suspended as long as the Antarctic Treaty is in force.

Without in any way belittling our Antarctic research commitment, I find the need for international scientific cooperation in the Arctic even stronger than for the Antarctic. Precisely _because_ there are indigenous populations, _because_ there is resource development, _because_ of the strategic importance, and _because_ of the existence of boundary disputes over adjacent waters.

A Research Policy, tied to a United States Arctic Policy would help establish a much-needed _coherent_ approach to international scientific cooperation with other Arctic nations, friends and foes alike. At the present time, cooperation exists--but it is mostly bilateral, sporadic, piece-meal, uncoordinated, short-term, boom-bust, just as our Arctic research at home.

Benefits to National Defense

The United States has never fought a war in the Arctic or under truly Arctic conditions. Our principal potential adversary has won several wars _with the aid_ of Arctic conditions.

Let me pose a few questions. What research is being done concerning performance of smart weapons--from single heat-seeking missiles to terrain-recognizing drones--under ice fog conditions or under an intense auroral display? What research is being done on the effects of high-latitude space disturbances on orbital or over-the-horizon surveillance systems? What research is being done on the basing of weapon delivery systems in frozen ground? What research is being done on the effect of snow and permafrost on seismic and acoustic vehicle and personnel detection devices? What research is being done on radioactive fall-out dispersion in the arctic atmosphere? What research is done on the construction and operation of underground command posts and power plants in permafrost terrain? What research is being done on adequate protection of pipeline installations from terrorist attack or terrorist seizure? What research is being done on chemical warfare in Arctic climate? What research is being done on auroral effects on military space systems? What research is being done on the prediction of the effects of high-altitude nuclear detonations on the auroral regions? What research is being done relevant to the defense of the resource extraction systems of Alaska? Are we just hoping that combat will never take place in the Arctic?

Of course, a public Arctic Research Policy will not address nor include this kind of research of Department of Defense incumbency. But I trust that the Policy will create a research environment conducive to provide DOD with crucial information, environmental data, basic research and, above all, expert manpower needed to answer the myriad of relevant technical questions. And the mechanisms set up for an Arctic Research Policy will serve as a conduit to channel specific questions and present relevant research opportunities to the civilian scientific community.

Thank you, Mr. Chairman for the opportunity of this testimony!

PREPARED STATEMENT OF DAVID M. HICKOK

Mr. Chairman, I am David Hickok, current chairman of the Alaska Council on Science and Technology and Director of the University of Alaska's Arctic Environmental Information and Data Center. Thank you for this opportunity to testify on S.1562, the "Arctic Research and Policy Act of 1981".

Initially, may I join with many of my colleagues in government, in academia, and in the private sector in applauding the initiative of Senator Murkowski in introducing this legislation and in Senators Stevens and Jackson in joining with him in cosponsorship of S.1562.

The imperative for this Nation to articulate and commit its support to a strong, coherent arctic science policy has never been greater. It isn't a new effort, of course. The long history of prior efforts is set forth in a publication my colleagues and I authored under the aegis of the Arctic Division, AAAS entitled United States Arctic Science Policy. I have no reason to repeat this history here. Suffice to say that it began in 1964 when Senator Bartlett, just as Senator Stevens has done more recently, brought attention to the great disparity in national funding between antarctic and arctic research in the appropriations committee of the U.S. Senate. Efforts to prepare an executive branch commitment to arctic policy continued under the aegis of the former Federal Field Committee for Development Planning in Alaska. After three years of efforts within all executive agencies a U.S. arctic policy position was agreed upon and forwarded to President Johnson for signature in 1968. Unfortunately, the President became ill in his later days of office and did not sign the statement. In 1969, the Federal Field Committee, working with Dr. Edward Wenk, Jr. then Executive Secretary of the Marine Resources and Engineering Development Council, prepared another arctic science policy statement which was adopted and published by that Council in their 1969 report Marine Science Affairs-A Year of of Broaden Participation.

To this day that brief statement remains this Nation's only official arctic science policy statement. Through the 1970's many other attempts were made in the executive branch to secure sustained and coordinated arctic science programs within the framework of national policy. All efforts failed due primarily to bureaucratic rivalries and budgetary protectionism. Last year, somewhat in despair but ever hopeful, my colleagues and I set forth the premise that only the Congress could provide the necessary forum for resolution of the disgraceful condition of U.S. scientific endeavor in the arctic region.

Now, we have a chance, thanks to the sponsors of S.1562, to begin anew and forge a policy framwork for U.S. arctic science programs which will show the way to national achievement and enhancement in resource development, national defense, human and community condition, environmental protection, transportation, and communication in the arctic region. Many of the imperatives I see for a strong coherent national commitment to arctic science are set forth in our "white paper," U.S. Arctic Science Policy, which, should you Mr. Chairman concur, we would appreciate being made a part of the record of these hearings. Before leaving the problem of national need, however, let me emphasize the extremely important and prequisite role of scientific and engineering research in natural resource development.

Given the extreme importance of oil, gas, strategic and critical minerals to the general economy, societal well being, and fiscal position of this nation, it is utterly beyond my comprehension that we as a people have not mounted an all out effort to find, develop, and appropriately transport and market these resources which we know to exist in arctic Alaska, both on and offshore. The role of scientific and engineering research in accomplishing this objective is paramount. Such research can give us the comprehension of natural systems and forces which will allow us, for example, to:

- properly design and build ports and harbors and offshore facilities in ice-stressed seas, and the ships needed for research and trade carrying oil, gas, and minerals;
- properly assess environmental impacts and promulgate any necessary mitigative measures for the living resources of our waters and lands; and
- properly assess the timing of resource development activity so that cost effective operations can be achieved in balance with environmental and living resource concern (an example of this problem lies in the "drilling window" question wherein great discourse is taking place without a complete factual foundation).

Other prominent needs for the application of research to resource developmental progress exist and these are but a few examples; but for purposes here I'd like to complete my testimony with more specific comments on the content of S.1562.

The following are some specific suggestions for conceptual change or emphasis in S.1562.

1. The question of recognition of what the arctic is and means, rather than definition per se, should be addressed. In the context of this legislation this recognition should be made on an arbitrary political rather than on a strictly scientific

basis. The reason for this is that definitions based upon scientific measures, i.e. permafrost, tree line, sea-ice limits, etc., all vary. Functionally, the arctic might be best described in terms of U.S. political, social, economic, and scientific interests. These interests are national in nature and transcend Alaska, per se, and thus inclusion of the basin of the Arctic Ocean and the Greenland Sea are equally important to U.S. territorial interests in Alaskan lands and waters. For recognition of Alaska's arctic, I'd recommend inclusion of all lands north of the PYK line referenced in the Alaska Statehood Act and all waters north of the Aleutian Islands, including the Bering, Chukchi, and Beaufort Seas.

2. On the question of science information transfer, recognition of several institutions such as the University of Alaska's Arctic Environmental Information and Data Center'seexistence and the network of information exchange already in place seems desirable. For example, all climate and weather data for arctic Alaska are kept at Arctic Environmental Information and Data Center, linkages with Canadian and U.S. petroleum interests are in place and AEIDC maintains and publishes, annually, the Current Research Profile, listing all known research efforts. But most importantly, there should be no identification of any one place as a central repository for arctic knowledge. Rather language should direct the Arctic Research Council to formally establish and recognize an appropriate science information exchange network on arctic science and resource knowledge. This might be reinforced by appropriate memoranda of agreement nationally and internationally.

3. On the matter of organization of the Arctic Research Council, there are several points to be made.

First, the Council needs to be a federal council, but it should, in its composition, transcend just three agencies and also recognize the national interests of over 100 universities involved in arctic research and many industrial private sector involvements. After all we desire here to solve problems and these problems involve many interests. One way to do this would be to have the President appoint the Council with a designated federal chairman and other federal members appointed to represent academic and industrial interests active in arctic research.

The federal council might also be supported by agency, industrial, and university advisory committees.

In essence, we need an Arctic Research Council with some "clout" and one which forces the mission-oriented federal bureaucracy to pull together to solve energy, resource, defense, environmental, and human health and occupancy problems in cooperation with the State of Alaska, its peoples, and private industry!

4. On the question of the future of NARL, we must be realistic. NARL has essentially three major assets. These are: 1) it is economically beneficial to local residents; 2) it is a symbol of U.S. arctic science presence; and 3) it is a useful specific support base for the conduct of scientific inquiry within the arctic basin and scientific research of opportunity due to location: on such problems as the populations and behavior of the bowhead whale, research into impacts upon natural systems occasioned by oil development of the National Petroleum Reserve-

Alaska and site specific sea-ice research along the Beaufort Sea coast, etc.

We must realize that U.S. arctic research interests greatly exceed the region of NARL's potential involvement-stretching today from the Aleutian Island arch past St. Lawrence and St. Mathews islands, the Bering Strait into the Arctic Basin, the high Canadian islands to Greenland, the Greenland Sea, and the Spitsbergen archipelago where the U.S. has treaty granted resource and very specific national defense interests in arctic research.

NARL, in my opinion, should be managed by some kind of operating authority established by the federal council. If the State is to be involved with costs of NARL operation, as proposed in the Sec 1007 report, then the State also needs to have a direct voice in the approval of the management scheme proposed and the programs to be executed.

Finally, a comment on the funding approach set forth in S.1562. As the committee is aware, various approaches to outer continental shelf shared revenue formula are being advocated by individuals in the Congress and reportedly by Secretary Watt. Although several interests-coastal zone planning, grants for community impact from oil and gas development, funds for the National Sea Grant Program and arctic research-may need to be accommodated by OCS shared revenues, I would regard this as an opportunity, rather than a hindrance in the long-run. A larger constituency supporting the concept of shared revenues from the OCS should help break down the barriers to formula funding long held by the Office of Management and Budget. If we can surmount the conceptual objection then, it becomes a "horse trading" situation on who will get how much.

In closing Mr. Chairman, let me again thank you, Senator Murkowski, and Senator Jackson for the introduction and the opportunity to appear before you today.

STATEMENT OF OLIVER LEAVITT, TREASURER OF THE ARCTIC SLOPE REGIONAL CORPORATION ON S. 1562 - THE ARCTIC RESEARCH AND POLICY ACT OF 1981 BEFORE THE UNITED STATES SENATE COMMITTEE ON GOVERNMENTAL AFFAIRS

FAIRBANKS, ALASKA
APRIL 7, 1982

Mr. Chairman, and members of the Committee, my name is Oliver Leavitt and I am appearing before you today as the representative of the Arctic Slope Regional Corporation (ASRC). ASRC appreciates the opportunity to offer its views on S. 1562, the Arctic Research and Policy Act of 1981.

ASRC is one of the twelve Native regional corporations established pursuant to the provisions of the Alaska Native Claims Settlement Act of 1971. ASRC's shareholders are the 4,000 Native people of the North Slope.

Since the establishment of ASRC after the passage of the Claims Act, ASRC has undertaken numerous activities intended to benefit the people of the North Slope. Under the Claims Act, ASRC has selected and received conveyance of more than 5 million acres of land on the North Slope. Much of this land was selected for its resource potential, and ASRC has taken steps to explore and develop this potential. In addition, ASRC has established several for-profit subsidiaries focusing primarily on activities on the North Slope. Many of these subsidiaries provide services to other developmental activities on the North Slope. Thus, during the past decade, ASRC has been integrally involved in almost all of the resource development activities on the North Slope.

In contrast to all other resource developers operating in the Arctic, however, we are in a unique position. Our people have lived in the Arctic for thousands of years. We have lived almost exclusively off the land and the sea and the resources that they provide. Only through our understanding of the Arctic environment, knowledge passed on from generation to generation, have our people survived.

Today, and for the next several decades, the Arctic serves as the host for intense resource development activities. Long after this developmental activity has ceased, our people will continue to live in the Arctic and, hopefully, will have the opportunity to continue our traditional Native culture. Therefore, we are extremely sensitive to the concern that all developmental and industrial activities that occur in the Arctic take place in a manner that protects the natural resources on which we will continue to subsist after the mineral resources have been removed.

We view the passage of S. 1562 as critical to the realization of our goal of development of the Arctic's substantial mineral resources in a manner that preserves the fragile ecosystem of our home. Only by the establishment of a comprehensive, coordinated national Arctic research policy may the American people and, more particularly, the residents of the North Slope be assured that development will occur in a responsible manner after the completion of adequate research to ensure that these developmental activities do not have severe adverse impacts on the Arctic environment.

The Arctic is believed to contain vast stores of energy resources, in particular, crude oil and natural gas. In the past decade, the Nation has realized that its vulnerability to unstable foreign petroleum supplies can be significantly reduced by development of the Arctic's vast energy resources and much developmental pressure has been brought to bear in the Arctic. However, in developing the resources of the Arctic, the Nation has both a legal and moral obligation to the residents of the Arctic to assure that exploitation of our resources does not jeopardize the subsistence resources on which our nutritional and cultural needs depend.

The development and implementation of a coherent and comprehensive Arctic research policy is long overdue. Developers in the Arctic confront unique environmental conditions. Accepted practices and technologies that work in the lower 48 states may or may not work in the Arctic. It is important that methods be tested before they are employed on a larger scale where irreparable damage may occur. The enactment of S. 1562 will ensure that the necessary short-term and long-term research is conducted so that the inevitable developmental activities in the Arctic may be accomplished with minimum impacts on the Arctic environment and its residents.

In contrast to the low standing that the Federal government has accorded to Arctic research policy, it is ironic that the Federal government has consistently accorded substantial attention to research in the Antarctic. We are concerned that the Federal Government has given a higher priority to research in the Antarctic, a barren wasteland with little present resource value and no indigenous population, than it has given to research in the Arctic, an area of substantial resource development activity and the home of many thousands of American citizens.

This attitude is no more clearly reflected than in the government's decision to close down the Naval Arctic Research Laboratory, the only laboratory in the Arctic devoted to Arctic research. At the same time, we understand that the government has committed many millions of dollars for Antarctic research in the budget of the National Science Foundation. As residents of the Arctic, we resent this distorted sense of priorities.

We applaud the efforts of Senators Murkowski, Stevens and Jackson in proposing S. 1562 in an attempt, at long last, to establish a national Arctic research policy. We specifically support the funding mechanism in the bill as the best method to ensure that Arctic research policy is actively pursued without running into Federal budgetary constraints. When one considers the amount of money that the Federal government, the State of Alaska and resource development companies will earn as a result of exploitation of the Arctic, ASRC believes that the funding mechanism contained in S. 1562 is more than reasonable.

As residents of the American Arctic, as Native people concerned about the preservation of our culture and our heritage, and as responsible members of the Alaska corporate community, we will do all we can to cooperate in the effort to establish a coordinated, comprehensive national Arctic research policy and program that will ensure that the Arctic is developed in an intelligent manner sensitive to the fragile nature of the Arctic environment. Only through the cooperative efforts of the Federal government, the State of Alaska, the scientific community, private industry and the local residents of the Arctic may these goals be achieved. In this regard, I would like to underscore the points raised by the Mayor of the North Slope Borough in his testimony before this Committee today with respect to active Native involvement in the development of any Arctic research policy. As the long-term local residents of the Arctic, we have the requisite knowledge of the Arctic environment and we have the interest in ensuring its protection. Without our input, a workable Arctic policy cannot be developed.

Once again, I thank you for the opportunity to appear before this committee today. I am prepared to answer any questions that you may have.

PREPARED STATEMENT OF VERA ALEXANDER

Testimony on Senate Bill 1562

"The Arctic Research & Policy Act of 1981"

The United States has a very great stake in its northernmost lands, and in order to ensure optimal development, conservation of resources and environmental protection, must maintain a strong, high quality research effort in the Arctic. The research areas directly applicable to Alaska are very important, but many of the research areas which need attention also have global and national importance since the Arctic is a multi-nation mediterranean area. Furthermore, arctic regions have a strong influence on global climate. The U.S. must maintain a critical level of research effort in Alaska. In the past, a considerable amount of research was supported by the federal government for defense purposes. This has now declined. More recently, the Outer Continental Shelf Environmental Assessment Program had become an important element of the Alaskan research scene (funded through the National Oceanic & Atmospheric Administration by the Bureau of Land Management). This, too, is now on the decline. There is a danger that declining federal research support in Alaska could have serious long range consequences that would be counter to the interests of Alaska and the United States.

Therefore, I strongly support the promotion of an Arctic Science Policy and the major elements of this proposed legislation. In particular, I believe that a coordinating mechanism is essential. Obviously, financial support for science must also be available. Finally, serious consideration must be given to the problem of logistic support for research activities. I am not prepared to address the question of a laboratory--there are several options for land-based support, and these can be addressed more effectively by others. I do, however, wish to address the problems of marine research.

Alaska has not only the greatest proportion of the coastline of the United States, the majority of the continental shelf of the United States, but also a huge potential in sub-sea mineral resources and vast renewable marine living resources. Many land-based activities, including mineral extraction, require support by marine transportation, and a significant proportion of Alaska's population lives on or near the coast. It is certainly not in the interests of the United States to ignore these facts. In the past, some fisheries resources have become severely depleted. The background necessary to understand the needs for management of such fisheries is a broad-based comprehensive marine research program that provides understanding of marine systems and their biological stocks. Physical and chemical oceanographic processes as well as biological oceanography and fisheries science are all needed to address such questions. In other words, the whole system must be studied with a multidisciplinary approach, including material balance, inputs and outputs, circulation functions and the various processes. This kind of work needs to be done in all areas of Alaska's seas, and in the more northern regions requires specialized logistic approaches, which include ice-strengthened ships, aircraft and remote sensing from aircraft and from space. Marine mammal research as well as fisheries research cannot be carried out in isolation, but needs to be approached from an ecosystem perspective, and the present lack of an ice-strengthened ship is especially serious in impeding work which needs to be done in the seasonally ice-covered Bering and Chukchi Seas. Presently, ships of opportunity are used for this kind of work; amazingly, at present, often Russian research vessels.

Such ecosystem approaches to oceanographic problems are being developed rapidly, and real advances in understanding are on the horizon. At last we recognize that the world is not divided by disciplines and that you must study biological and physical phenomena on the same time and space scales.

Problems relating to the safety and health of Alaskans are also to be considered. For example, we do not understand the circulation of Prince William Sound sufficiently well to predict the trajectories of ice bergs calved from the Columbia and other glaciers. With increased shipping, this is a serious hazard. We need to understand more about storm surges and about coastal erosion in the Beaufort and Chukchi Seas. We need to understand better some marine biological problems which can impact fish resources and their utilization. An example is the problem of paralytic shellfish poison, which in Alaska is especially important in clams.

Many of the newer effective approaches to studying such a vast area as Alaska involve rather large sums of money. Satellite remote sensing, very effective in studying sea ice behavior and distribution, requires expensive vehicles, but even further, the costs of handling the data are high. Passive and active microwaves are very important too in sea ice and other oceanographic work. Remote sensing from satellites and from aircraft is an effective approach to marine mammal studies also.

The above examples are only the tip of a mountain of urgent research needs. The need for environmental assessment in relation to development of the coastal zones barely needs mention. Geological processes and mineral distribution must be addressed, and so on.

Much of the research mentioned can be done from a good oceanographic vessel, or from aircraft or helicopters, but a critically large proportion requires an ice-strengthened ship. In this regard, the U.S. lags significantly behind other nations. We have, of course, a fleet of icebreakers. These, however, are not designed for marine research, and their primary missions are not research. This is understandable, but the result is that scientists have a low priority _if_ they can get on board at all. Furthermore, many of the ships of this fleet are old, and the two newest ships are far too large to be effective or economical for research use. The United States is slipping behind even further, as other nations are launching new ships. Argentina has recently built a new ice-strengthened ship for research purposes. In December, 1981, Japan launched a new ice breaker to be dedicated entirely to research. And, of course, the Russian fleet outranks the U.S. by a huge margin. Even a nation with a rather small marine-based economy such as Finland has a fleet of small icebreakers which are available for research as well as a small ice-strengthened oceanographic research ship. Shipping in the ice-covered Baltic is certainly a justification, but their problems in this regard do not compare with the potential for problems of marine transportation in the Beaufort, Chukchi and Bering Seas, and the relative size of the two marine areas cannot be compared.

This proposed legislation provides a framework for addressing some of these problems, and hopefully will result in an effective approach to coordinating and funding marine as well as other Alaskan research.

Attached is a list of ice-strengthened ships of the world, which illustrates quite effectively the relative low position of the U.S.A.

Vera Alexander
Director
Institute of Marine Science

April 7, 1982

ICE-WORTHY RESEARCH SHIPS OF THE WORLD
Including Icebreakers (IB) of Limited Scientific Capability and Availability

	Year Built	Name	Length (loa, feet)	Displacement (tons)	SHP	Remarks
Argentina	1952	*General San Martin*	280			IB
	1979	*Almirante Irizar*	386	12,000	16,200	IB
	1979	*Puerto Deseado*	250			R
Canada	1956	*Baffin*	285	4,200		R
	1963	*Narwhal*	251	2,220		S
	1963	*Hudson*	296	4,660		R
	1965	*Endeavour*	207			R
	1967	*Dawson*	196			R
	1954	*Labrador*	269	5,300		IB
	1960	*John A. MacDonald*	290	9,000	15,000	IB
	1968	*Louis St. Laurent*	345		24,000	IB
	1971	*Carino*	145			Charter research vessel (Carino Co. Ltd.).
	1976	*Polarsirkel*	162		2,500	Charter research vessel (Carino Co., Ltd.).
	1978	*Pierre Radisson*	320	8,300	13,600	IB "R" Class (one under constructio
	1979	*Franklin*	320	8,300	13,600	IB "R" Class
	1979	*Canmar Kigoriak*	300	7,700	16,300	Dome Petroleum experimental icebrea
	1983		214		5,500	Charter research vessel (Carino Co. Ltd.).
Denmark	1957	*Thala Dan*	247			Two of J. Lauritzen Lines polar vessels frequently chartered for antarctic or arctic supply and scientific missions. Also 5 icebreakers.
	1961	*Nella Dan*	247			

ICE-WORTHY RESEARCH SHIPS OF THE WORLD
(Continued)

	Year Built	Name	Length (loa, feet)	Displacement (tons)	SHP	Remarks
Federal Republic of Germany	1955	*Anton Dohrn*	205			R Also 4 icebreakers.
	1973	*Explora*	234		3,500	R
	1982		332		16,500	R
Finland	1953	*Aranda*	173			R Refurbished in 1976.
	1958	*Karhu*	243	3,540	7,500	IB
	1959	*Murtaja*	243	3,540	7,500	IB
	1960	*Sampo*	243	3,540	7,500	IB
	1963	*Tarmo*	277	4,890	12,000	IB
	1968	*Varma*	277	4,890	12,000	IB
	1970	*Apu*	284	4,890	12,000	IB
	1954	*Voima*	274	5,210	13,930	IB
	1979	(Rebuilt)				
	1975	*Urho*	344	9,660	22,000	IB
	1976	*Sisu*	344	9,660	22,000	IB
France	1961	*Jean Charcot*	246			Antarctic resupply and research.
	1972	*Marion-Dufresne*	365			
Japan	1965	*Fuji*	325	9,000	12,000	RIB
	1982	*Shirase*	403	17,600	30,000	RIB
Norway	1958	*Johan Hjort*	172			F
	1960	*H.U. Sverdrup*	127			F

ICE-WORTHY RESEARCH SHIPS OF THE WORLD
(Continued)

	Year Built	Name	Length (loa, feet)	Displacement (tons)	SHP	Remarks
Norway (cont'd)	1951/77	*Polaris*	175			Available for charter as research vessels. G. C. Rieber & Co., Bergen, Norway.
	1968	*Kvitbjørn*	135			
	1970	*Kvitungen*	135			
	1975	*Polarbjørn*	162		2,500	
	1981	*Polar Queen*	214		5,500	
Sweden	1957	*Oden*	274	4,440	10,500	IB
	1964	*Tor*	277	4,890	12,000	IB
	1969	*Njord*	284	4,890	12,000	IB
	1974	*Atle*	344	9,660	22,000	IB
	1975	*Frej*	344	9,660	22,000	IB
	1979	*Ymer*	344	9,660	22,000	IB
Union of S. Africa	1961	*RSA*	223			S
	1978	*Agulhas*	354		6,000	Antarctic resupply and research
United Kingdom	1955	*Explorer*	202			
	1962	*Discovery*	260			
	1968	*Endurance*				Formerly *Anita Dan* (1956), converted.
	1970	*Bransfield*	325	4,800	5,000	Antarctic resupply and research.
USA	1968	*Hero*	125	640	760	NSF antarctic wooden trawler-research vessel.

ICE-WORTHY RESEARCH SHIPS OF THE WORLD
(Continued)

	Year Built	Name	Length (loa, feet)	Displacement (tons)	SHP	Remarks
USA (cont'd)	1943	*Westwind*	269	5,300	10,000	IB, refurbished 1974, 1975.
	1945	*Northwind*	269	5,300	10,000	De-commission in 1980's.
	1954	*Glacier*	309	8,700	16,900	IB
	1975	*Polar Star*	399	12,000	18,000-	IB
	1977	*Polar Sea*	399	12,000	60,000	IB
USSR	1952	*Polyarnik*	126			R
	1954	*OB*	426			R
	1956	*Pervenets*	128			R
	1956	*Okeanograf*	128			R
	1956	*Aysberg*	225			R
	1957	*Mikhail Lomonosov*	335			R
	1958	*Shtorm*	132			S
	1964	*Akademik Knipovich*	280			F
	1966	*Professor Weise*	408	6,900		R
	1966	*Petr Pakhtusov*	221			S
	1967	*Akademik Shirshov*	407			R
	1967	*Professor Zubov*	408	6,900		R
	1969	*Priliv*	319			R
	1970	*Dimitriy Laptev*	224			S
	1970	*Dimitry Ovtsyn*	219			S
	1971	*Stepan Malygin*	217			S
	1971	*Dimitry Sterlegov*	224			S
	1972	*Nikolay Kolomeytsev*	224			S
	1972	*Valerian Al'Banov*	224			S
	1972	*Edward Toll'*	224			S
	1973	*Vladimir Sukhotskiy*	224			S

ICE-WORTHY RESEARCH SHIPS OF THE WORLD
(Continued)

	Year Built	Name	Length (loa, feet)	Displacement (tons)	SHP	Remarks
USSR (cont'd)	1974	*Nikoley Yevgenov*	224			S
	1974	*Sercey Kravkov*	224			S
	1975	*Mikhail Somov*	437	13,000		R, AARI
	1975	*Vsevolod Berezkin*	180			R
	1976	*Professor Bogorov*	226	1,654	2,000	R
	1976	*Professor Kuventsov*	226	1,654	2,000	R
	1976	*Professor Vodjantskij*	226	1,654	2,000	R
	1976	*Fedor Matisen*	226	1,654	2,000	S
	1977	*Georgin Maximov*	226	1,654	2,000	S
	1977	*Ivan Kiveev*	226	1,654	2,000	S
	1977	*Pavel Bashmakov*	226	1,654	2,000	S
	1977	*Jakov Smirnitskij*	226	1,654	2,000	S
	1978	*Otto Schmidt*		3,650	5,400	R, AARI, icebreaker laboratory
	1978	*Rudol'f Samoylovich*				R, AARI
	1979	*Professor Shtokman*	226	1,654	5,000	S
	1980	*Akademik Metislav Keldysh*	401	5,500	5,800	R
		Icebreakers:				
	1954	*Kapitan Belousov*	273	3,375	10,500	
	1956	*Kapitan Voronin*	273	4,375	10,500	
	1956	*Kapitan Melekhov*	273	4,375	10,500	
	1959	*Lenin*	440	16,000	44,000	N
	1960	*Moskva*	401	12,840	22,000	
	1961	*Leningrad*	401	12,840	22,000	
	1965	*Kiev*	401	12,840	22,000	
	1968	*Murmansk*	401	12,840	22,000	
	1969	*Vladivostok*	401	12,840	22,000	
	1974	*Yermak*	442	20,240	36,000	
	1975	*Arktika*	492	23,400	75,000	N, August, 1977, voyage to North Pole.

ICE-WORTHY RESEARCH SHIPS OF THE WORLD
(Continued)

Year Built	Name	Length (loa, feet)	Displacement (tons)	SHP	Remarks
	Icebrakers (Cont'd)				
1975	*Admiral Makarov*	442	20,240	36,000	
1976	*Kapitan Kosolapov*	185	2,045	3,400	IB
1976	*Kapitan M. Izmaylev*	185	2,045	3,400	IB
1977	*Sibir*	492	23,400	75,000	N
1977	*Kapitan Sorokin*	434	14,900	22,000	
1978	*Kapitan Nikolayev*	434	14,900	22,000	
1980	*Kapitan Dranitsyn*	434	14,900	22,000	IB
1981	*Kapitan Khlebnikov*	434	14,900	22,000	IB

ABBREVIATIONS: R - Dedicated research vessel
F - Fisheries research
S - Survey vessel
IB - Icebreaker, limited scientific capability or availability
ARRI - Arctic and Antarctic Research Institute, Leningrad
SHP - Shaft horse power
N - Nuclear powered

NOTES: *Eltanin*, built in 1957, loaned to Argentina 1974-1979 (Islas Orcadas), returned to U.S., not in service.
Some U.S. ships, such as R/V *Alpha Helix*, have modest ice-strengthening insufficient for sustained, unaided operations in sea ice.
Poland has modern ice-worthy trawlers and at least one research vessel which have been used in exploratory Antarctic krill investigations.
USSR information incomplete, many modern ice-worthy trawlers and cargo vessels in national fleet, some occasionally used as research ships, *Zveroboi* class stern trawlers (237 feet, 3300 SHP) used for marine mammal-fisheries research in sea ice. Several icebreakers built in Finland.
The world inventory of icebreakers (in service and on order) numbers about 130 ships. Approximately one-third of these are of USSR registry.
The Wärtsilä shipyard in Finland is the primary supplier of icebreakers to the world, having built at least one-half of all tonnage in this category since 1945. That firm has prepared a project design for a new icebreaker for year-round polar service having 50 thousand tons displacement and 140 thousand SHP.
Canada has plans for a "Polar 10" icebreaker, 150 thousand SHP.
Australia is planning a research ship specifically for antarctic work.
Peoples Republic of China plans to build a 280 foot, ice-strengthened research vessel.

SOURCES: *The Motor Ship*
Oceanographic Vessels of the World
Polar Operations, MacDonald, 1969
Polar Record
Polar Times
Ship and Boat International
National Science Foundation
ARRI, Leningrad
Oy. Wärtsilä, AB, Finland
G. C. Rieber Co., Norway
J. Lauritzen Lines, Denmark
German and Milne, Montreal
Dr. T. Armstrong, Scott Polar Research Institute

Compiled By R. Elsner, 1971
Revised, 1973, 1978, 1980, 1982.

I made a couple of points that were not in the text:

1. The Institute of Marine Science has used Soviet research vessels for work in ice-covered seas at least 4 times in the last 6 years. This is for federally-funded work. (Part of the U.S./U.S.S.R. cooperative program.) No U.S. ships are available for this work, which primarily deals with marine mammals.

2. It is not in the research funding that the antarctic and arctic programs differ so much even within the National Science Foundation. The arctic program is only partly in the Division of Polar Programs, and much support comes from other parts of the Foundation also. However, logistics have to be supported for the science budget, whereas in the antarctic program logistics are budgeted separately, and some of the equipment comes out of the non-science budget also. This results in a big problem for arctic programs, since the costs of carrying out arctic research are also high.

Vera Alexander
4/9/82

Senator **Stevens**. Our next panel is the resource panel. Mr. Richard Weaver of the Alaska Oil and Gas Association, Dr. William Sackinger, a professor of the Geophysical Institute, of the University of Alaska, and Chuck Hawley of Hawley Associates, mining consultants. This will be our last panel.

TESTIMONY OF RICHARD WEAVER, ALASKA OIL AND GAS ASSOCIATION; WILLIAM M. SACKINGER, GEOPHYSICAL INSTITUTE, UNIVERSITY OF ALASKA; AND CHUCK HAWLEY, HAWLEY ASSOCIATES

Mr. **Weaver**. Senator Stevens, Senator Murkowski, I'm Richard Weaver. I'm the operations manager for Exxon here in Alaska, and vice-president of the Alaska Oil and Gas Association. Today I'm speaking on behalf of the association and its 36 companies who are engaged in, or contemplating petroleum operations in Alaska. We would like to express our appreciation for having the opportunity to discuss S. 1562. From an examination of the bill, it would appear that there may be a lack of awareness of the broad and comprehensive scope of existing Arctic research programs being conducted by industry, government, and academia. We believe that the contention that the Nation is suffering from a dearth of Arctic research and technology, and that the efforts are far too fragmented, is not fully correct. My discussion today will endeavor to give you a capsule picture of the depth and breadth of the current Arctic research program with emphasis on the particular programs being conducted by the petroleum industry.

I'd also like to briefly discuss our position relative to certain provisions of the bill itself. To begin with, I'd like to call your attention to the research programs of the Federal Government, such as the extensive program being conducted under the OCS environmental assessment program. This work is being performed by the NOAA under a contract to the BLM of the Department of the Interior. The emphasis of this program is on biological and social economic issues, related to the future OCS lease sales. Reports of this work, which are very comprehensive, are promptly and widely distributed.

Another Federal research group is the U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory, in Hanover, N.H. It is highly respected for both its laboratory research and its field work. Its field projects emphasize ice mechanics and permafrost studies while the laboratory includes ice basins for the testing of the effects of moving ice on models of ships, harbor facilities, and other structures. In addition to the studies of the physical aspects of the environment, this group has done extensive studies on the biota of the tundra.

Among the programs conducted by academic institutions, the University of Alaska has conducted research on permafrost, sea ice strength, and marine biota. It is also recognized for its work in the physical marine science, as we've just heard. The University of Washington has conducted an extensive study of sea ice dynamics.

As a point of interest, and I'll return to this point later, both laboratories have used the NARL laboratory at Barrow for support of their research programs.

Now let me discuss the R&D programs which are being conducted by the petroluem industry. Because of the extensive biological research being done on the Government programs, the industry programs have primarily dealt with the physical aspects of the Arctic environment, such as ice mechanics, oceanography, and meteorology. The industry has spent or committed over $40 million on 152 Arctic research projects. The pace of these projects is increasing such that 40 of them are active at this time. An extensive bibliography of the Arctic research projects will be submitted for your review, and we would appreciate this document being included in the record. Details of any of these projects can be made available.

I would like to take a few moments now to briefly describe several examples of industry projects presently underway. Shell Oil Co. is managing a program for the development of instrumentation that will use sonar from automated instrumentation on the ocean floor to profile the underside of pack ice, and to measure the movement of the ice pack. This project complements a number of separate projects for measuring the rate of movement of landfast ice using wireline measurement stations. Several projects for measuring the strength of sea ice are in progress. One of these is managed by Exxon, measured the strengths of large ice blocks on-site in the Arctic. These large scale measurements are then correlated to the strength measurement of small samples collected in the Arctic, and shipped to ice strength laboratories. With the realtionship known between the large and small scale ice strengths, we can concentrate our efforts on small scale samples, which are considerably easier to collect and to test.

Under other projects, model tests are being conducted in ice basins at various facilities, to determine the reaction of the various structure shapes and vessels to the forces of moving pack ice. The Bering Sea, where several lease sales are scheduled in the near future, has up until now been an area of relatively sparse meteorological and oceanographic data. Under a joint industry program, and with the cooperation of NOAA, we are now gathering weather data through a network of land-based and buoy-mounted weather stations, and receiving this data through the NOAA's weather satellite. This is one of the most technologically advanced meteorological and oceanographic programs ever undertaken. All of the weather data is available to the public, and is being incorporated into the weather forecasts by the Anchorage National Weather Service Officer.

Several projects are underway in the design of structures for exploration and production that will be capable of resisting moving pack ice in the Bering Sea and in the shear zone and beyond in the Beaufort and Chukchi Seas. These designs will rely heavily on the ice movement and strength measurements that I mentioned previously, supplemented by model tests that are being conducted on the various shapes which are under consideration. Technology developed in this work will allow us to conduct petroleum operations in all Arctic areas presently scheduled for leasing in a safe and efficient manner.

Regarding dissemination of these results, AOGA has an ongoing program for conveying all project reports for which the confidentiality has expired, to the following three organizations, the Arctic

Environmental and Information Data Center in Anchorage, the U.S. Army Cold Regions Research and Engineering Laboratory in New Hampshire, and the Arctic Institute of North America in Calgary, Alberta. Besides these cooperative industry efforts, extensive Arctic research programs are being conducted by individual companies that contemplate operation in the Arctic. Results of much of this in-house research reaches the public domain through papers presented by company experts at technical meetings, or published in technical literature.

An example of this was the Gravel Island seminar conducted in 1979 by Exxon, and which was open to any interested party. In this seminar, Exxon presented the technology for the design of Gravel Exploration Islands in the near shore Beaufort Sea. In addition to the industry-funded research being conducted in the United States, our scientific community has access to the results of Arctic research projects being conducted by the Canadian Government and by Canadian petroleum joint industry groups. One of these groups, the Arctic Petroleum Operators Association, has conducted 193 projects at a cost of $30 million. U.S. companies or their Canadian affiliates are funding participants for most of these projects. Because of the interchange between the United States and Canadian researchers, and because Canadian regulations are less restrictive than the U.S. Marine Mammal Protection Act, which considers just causing a marine mammal to change course to be the equivalent of taking it, the Canadian researchers can do more to actually observe the effects of various operations on mammals. Their work therefore complements the research being done in Alaska.

In the area of biological research, Sohio has managed a joint industry project for counting bowhead whales in the Canadian Arctic, and to get data of estimating the current bowhead population. In addition, a group of companies joined in the funding of an Eskimo-managed bowhead whale census off Point Barrow last summer. Industry studies have complemented those of the BLM in making observations on the behavior of bowhead whales, in the vicinity of dredging operations, boat traffic, drilling, and seismic operation in the Canadian Beaufort. None of these activities created sufficient disturbance to cause the whales to either vacate an area, or to significantly alter their behavior.

Several companies have been active in developing new methods for cleaning up oil spills on and under Arctic ice. Among these developments is the arcat skimmer, which a catamaran-type vessel designed for operating in areas of broken ice. Tests have also been run to assess the effectiveness of using chemicals for dispersing spills in cold water. Considerable cross-communication occurs between industry, Government, and academia during the synthesis meetings and environmental impact statement hearings held for prospective lease sale areas under the auspices of the BLM. In addition, representatives of the Government often attend bimonthly meetings of the AOGA's lease sale planning and research technical subcommittee, where joint industry projects are reviewed.

In this overview, I wanted to show that there's a great deal of Arctic research under way, and that the results of this research are being disseminated to the scientific, technical, and academic communities, even though the Government may not always be fully aware of the activities.

Now, I'd like to discuss the Arctic research bill that is the topic of today's hearing. Although we would support the steps to enhance and streamline existing communication and coordination of Arctic research activities, we do not see the need for the establishment of a high level Arctic research council as proposed in the bill. Further, we do not feel that, given the current level of industry funded research in both the United States and Canada, there's a need to commit annually up to $25 million of Federal revenue to Arctic research. My earlier comments have indicated the breadth and depth of the research programs being conducted. We feel that an additional layer of control to that process that is already functioning well, could inhibit the flexibility and responsiveness of the current programs. As an alternative, we would propose the encouragement of governmental agencies repsonsibile for research to solicit industry input as to the usefulness of their proposed programs, and to work cooperatively with industry to better define those roles that each should have in the conduct of Arctic research. A working level committee with a maximum membership of about 10 people could be formed with several members each from Government, industry, and academia, to discuss plans for Arctic research, and to optimize on a strictly voluntary basis, the role of each of these three sectors. This standing committee could function in a similar manner as the effective ad hoc groups that have been assembled for OCS presale synthesis meetings.

An aspect of the bill that is of particular concern to the industry is the provision that requires a permit applicant to fund or perform all research required to answer any environmental questions raised by the permit application. The judgment of just how much research would be required would be made by an agency responsible for issuing the permit. Our concern here is that we could encounter a situation where every conceivable question and every conceivable fear, independent of their significance or basis, would have to be answered. We could expect agency scientists' requirements for prolonged or esoteric studies to unnecessarily obstruct the expeditious development of Arctic oil and gas resources. This situation would compound the existing regulatory snarl by further retarding the permitting process. The disruptive effects of permitting delays based on unsubstantiated fears of environmental impacts were cited in the National Petroleum Council's 1981 study of the Arctic oil and gas resources, as being major roadblocks to petroleum development in the Arctic. This provision could result in the delay of Arctic exploration, and increase the cost with no increase in safety or environmental protection.

Finally, it would appear that one of the purposes of the bill is to revive the operation of NARL. Although we don't believe that the facility is needed as a major research center, we do believe that a facility would be extremely useful as a field experiment station and logistical support base for research performing entities including academia, Government, and industry, on an appropriate cost-sharing basis. We strongly recommend that means be found for accomplishing the reestablishment of NARL as a logistic base, but without endowing it with the authority for independently coordinating or directing research programs.

Before closing, I would note that the AOGA member companies are also concerned with the socioeconomic issues that are being *raised by the prospect of petroleum activity* in the coastal areas and offshore Alaska. AOGA, and several individual companies, have been conducting communication programs that not only convey the state of industry's technical and operating competence to the lcoal citizens, but also provide the industry information on local conditions and concerns. These programs are providing the base for dialog with local interests that will form a foundation for mutual confidence for developing future business relationships.

In summary, Senator Stevens and Murkowski, the Alaska Oil and Gas Association believes that the record shows that there is a wealth of Arctic research which has been and is being conducted by industry, Government, and academia. The results of this research are being applied affectively, and are being assimilated through the existing organizaitons. AOGA would be pleased to work with you and your staffs to provide an opportunity to see specific research programs and today's applications of Arctic technology. We support your interest in furthering Arctic research, but we do not believe that S. 1562 as constituted is necessary to achieve that end. Thank you for this opportunity to express our views, and we'd be happy to answer any questions.

Senator STEVENS. Thank you. Dr. Sackinger?

Mr. SACKINGER. My name is William Sackinger, and I'm a member of the faculty of the Geophysical Institute here at the University of Alaska. However, my testimony today represents my own individual viewpoint.

Thank you for inviting me to appear before you to discuss the crucial role of applied research and the timely development of the oil and mineral resources of Alaska. I have prepared a written statement for the record, and would like to mention some highlights from it. Before I delve into details, it should be pointed out that other existing and growing Alaska industries, such as fishing, agriculture, and timber, all contribute to national and to world needs for food and building materials. The importance of applied research on Arctic problems faced by these industries cannot be overstated, for renewable resources such as these represent the economic foundation of our society.

Now with respect to the oil, gas, and mineral resources, a recent report by the National Petroleum Council Committee on Arctic oil and gas, has estimated that the North Slope, together with the offshore areas in the Beaufort, the Chukchi and the Bering Seas, contain 24 billion barrels of oil, and 109 trillion cubic feet of gas waiting to be discovered, developed, and delivered to the American consumer. These are mean values involving 20 prospective regions. The discovery of oil in at least several of these Arctic offshore provinces is virtually certain. Using today's values, this national resource is worth about $1.25 trillion dollars. The optimum recovery of this petroleum resource must command serious national attention, and the petroleum-related activities must be conducted in a safe, prudent, and environmentally-sensitive manner consistent with law and national policy. As one of our former speakers mentioned, the most serious technological challenge in the Arctic offshore is the destructive power of the moving and shifting pack ice. Exploration drilling in the Bering Sea and parts of the Chukchi Sea, however, can be accomplished during the benign ice-free summer interval. Exploration drilling within the 20-meter water depth contour of the Beaufort Sea can and has been done successfully in the winter months when the ice motion in that area is usually quite limited.

However, production facilities must be designed for year-around operations, and the statistical probability of extremely severe ice damaging events, even if they may occur only once in the life of the oilfield, should be considered in the design process. The severity of these ice hazards depends upon the ice thickness and type, the speed of the ice movement, and the mechanical strength properties of the ice. All of these parameters are subject to statistical fluctuations as they occur in nature. A sizable set of measurements is required to define the extremely severe ice conditions, such as the event which occurs once in 100 years. Exploration islands in the Beaufort Sea have successfully withstood annual ice formed within 1 year with thicknesses ranging up to about 6 feet.

But a greater hazard is the multiyear pack ice that's several years old, which is perhaps 20 feet thick, as we've commonly seen. And there have been thicknesses up to 150 feet thick inferred from the ice scour marks that are left on the sea floor. This thick ice can ground out on the sea floor, and stop moving before it intrudes into the shallow water, but the details of this beneficial process, which could shield offshore production islands and structures, still remains to be quantified. Conservative designers are likely to allow for multiyear ice thicknesses roughly equal to the water depth at a given installation. However, further research may reveal that this is not necessary. As water depths greater than 60 feet are offered for lease in the Chukchi and the Beaufort Seas, knowledge of the ice conditions would be an important factor in deciding whether reservoirs can be developed economically.

The use of these traditional massive artificial islands is very costly in deeper water, and concepts such as retained fill islands with concrete caisson walls are just now being implemented. The limits of the technical and the economic feasibility of these structures, and also the extreme ice conditions to be expected, will certainly affect the offshore bidding, the exploration rates, and the field development rates in the Beaufort and the Chukchi Seas. High cost will be the penalty of the uncertainty, and the costs will ultimately be paid by the American public, either in their role as taxpayers or as consumers.

A specific benefit of the Arctic Research and Policy Act would be to reduce these costs of uncertainty, and providing for research which qualifies the technical obstacles to offshore petroleum development. Ice research has been specifically recognized in a recent report by the National Petroleum Council as an important subject for governmental research. Of course, marine transportation of produced oil, gas, and minerals is quite likely for regions of the Bering Sea and the Chukchi Sea. The Trans-Alaska Pipeline is likely to be used for production of oil from the North Slope and the Beaufort Sea. Icebreaking supply boats and medium-size icebreaking oil tankers are feasible for the Bering Sea. Winter marine transport has been carried out in the Baltic Sea for decades in conditions similar to those in the Bering Sea.

The recent novel and improved icebreaker trials in Canada and in Germany have shown us that there is even an excellent prognosis for wintertime commercial icebreaker operations in the Chukchi Sea. The severity of the ice, in the form of thickness extremes, affects the reliability and economics of this marine transportation on a day-to-day and mile-by-mile basis. The methods of ice forecasting and reconnaissance need to be improved to make this sort of operation commercially feasible in the Chukchi Sea. The extraction of large natural gas reserves in the Arctic offshore, using LNG icebreaking tankers, is technologically within reach, but the economics depend upon ice.

Because of shallow water near the shoreline, offshore loading terminals will be required for medium and large ships, and ice management at berthing areas will be necessary. The movement of minerals and of coal from the coasts of the Bering and Chukshi Seas, in icebreaking bulk carriers, is technologically within reach as well. Federally funded research on ice made possible by this Arctic Research and Policy Act would remove this single existing technical barrier to oil and mineral development in the western Arctic. Of course, federally sponsored research should proceed in cooperation with industrial and State-sponsored research, complementing it in a manner consistent with Federal policy objectives.

Major industrial investments and the delivery of minerals and petroleum to the American public will take place after these technical uncertainties are resolved. Of course, there's a dual governmental mission of insuring an effective and economic use of petroleum and mineral resources while establishing appropriate standards for acceptable risks for human safety and for environmental protection. This has been established by the Congress, and regulations have been promulgated to achieve these ends. Knowledge of the environmental hazards, and of the detailed sensitivities of the environmental ecosystems, is needed for these regulations to be realistic. In the absence of such knowledge, the regulatory decisions tend to be overly conservative, which slows down the resource development.

The Arctic Research and Policy Act, applied broadly, could still research gaps in all areas of importance to the regulatory mission of the executive branch of government in the Arctic. Resource development would be expedited as decisions would be made in the light of a more adequate information base. The timely development of the petroleum and the mineral resources of Alaska, a matter of high priority, depends upon detailed knowledge of those special factors imposed by nature which face the industrial design teams and their regulatory agencies. The flow of this essential information into the hands of these users will take place if the Arctic research and policy bill is enacted.

In my opinion, S. 1562 is in the national interest and it has my unqualified support.

Thank you very much, and I would be pleased to answer any questions that you may have.

Senator STEVENS. Thank you very much, Dr. Sackinger.

Mr. Hawley?

Mr. **HAWLEY**. Thank you, Senator.

I am Charles Hawley, a mining geologist testifying at invitation. I think in view of the testimony on petroleum impact, and sea ice, maybe the best thing that I could be briefly would be to talk about some of the mineral developments which could happen, and stress that, and leave most of the other record open.

Certain things have happened in the last few years which confirm a very major metallic resource in the Brooks Range, and in the true Arctic, say above the Arctic Circle, as well. And so, when you look at the Ambler River belt in the south flank of the Brooks Range, which is north of the Arctic Circle, there is, and these are really conservative figures, at least 50 million tons of high-grade zinc-copper ore. In the north flank belt, including the Red Dog deposit, there's in excess of proven reserves, drilled reserves, of over 100 million tons of high-grade zinc-lead-barite ore. And then there are the very large coal resources of the Slope generally north of the Brooks Range, or involved to some extent, in the northern Brooks Range, as well as at least some potential for phosphate, oil shale, fluorite, and precious metals which also exist within this Arctic area.

The recent surface coal legislation, would appear to inhibit the surface development of coal on Federal lands in northern Alaska, and we have a very uncertain knowledge of exactly how we would develop underground development of coal. For example, some of the hydraulic techniques which you could use in more temperate climates may or may not work in Arctic. I guess I would agree with Mr. Weaver that the private sector is doing a lot of detailed scientific work, especially on individual sites. For example, in the Red Dog area, there's an extensive environmental work being conducted by Cominco through various contractors. This is important research work.

The projects, however, are extensive enough that quite a few of them do cross jurisdictional boundaries, and in the total development of the metallic resource, there has to be, I believe, a little bit more coordination between industry, rural Alaskans, the several Federal agencies, and the State of Alaska. And I really believe perhaps from my longtime background with the USGS, that there are basic research efforts that remain best done in the public sector, perhaps pragmatically from the reason that if they's done entirely by industry these things are always suspect.

So I guess in summary, I support the effort, and I believe that there is a need for a more comprehensive Arctic national policy. Pragmatically, in listening to some of the earlier people, and again, going back to my own background, why the kind of apolitical and scientific work that was carried on by the USGS in times past, and some of the other agencies, really does have a place. And so in operating a structure like this, an independent agency which has carryover beyond the bureaucracy, say beyond the Secretaries of Interior, or Defense, really is needed to sustain this thing for a long period to time.

Senator **STEVENS**. Thank you very much.

Mr. Weaver, do you see this bill as being another source of regulatory burden upon development? Is that what you are saying?

Mr. **Weaver**. We have some concern that it will create another layer of control over what is needed in terms of an ongoing research effort. We support and believe that the purpose of the bill to enhance a crossflow of communications is very good, and we support that objective, but we do see that certain aspects of the bill could raise problems.

One, as I alluded to, is the requirement for permittees to fund all research necessary to answer all questions. Another area that is of some concern to us is the authority that is vested in terms of prioritizing research, which we feel needs to be done in a broad sense. Certainly the priorities set by such groups should not preclude any agency or group, such as industry that has a real need for a type of work, from proceeding with that research.

Senator **Stevens**. Well, let me assure you, I didn't think it was Senator Murkowski's intention, nor mine, nor Senator Jackson's, to in any way inhibit research being done by the private sector. We were talking about prioritizing research being conducted through Government efforts as a result of funds created and made available through the OCS funding that was contemplated by the bill. But hasn't industry used some of the research that was done during the 1950's and the 1960's and the 1970's by NARL?

Mr. **Weaver**. Very much. I think that industry has attempted to apply the research whether it comes from former Government studies, current studies, academia, or our own work. I believe that our success in moving ahead in our exploration efforts into the shallow Beaufort Sea utilizies aspects from all groups. We believe that there are aspects of research which we have conducted which might very well fall in the public domain. What we feel is that an improved interchange to assure that those limited resources, which as a nation, we have to devote toward research, are properly applied and we don't end up overlapping research, that is there would be an input in terms of where research is needed.

Senator **Stevens**. I think our feeling would be that your efforts would be part of the effort to assure that your proposed developments comply with the previously established standards, environmental standards, and other standards of government that are necessary and commendable. But we're talking about a long term policy, a long term research effort, of which the oil industry is just part of the continuum. And I must say I think that Senator Murkowski and I were both surprised at the position taken by AOGA, in view of that intent.

We'd be most happy to work with you to see what could be done to reassure your principals that we are not seeking to hinder development, or to develop any regulatory controls over industry research. We are trying to provide basic data and the baseline information that is necessary for that research. We also need to establish Government policy that might affect your development, or any resource development. I hope that AOGA would review the legislation again, and would, through your member companies, work with our staffs to see if we can't develop an approach that would eliminate your objections. Or, at least, put you in a neutral stance. Because I view this legislation as being very essential. No one here has mentioned today that the efforts of Governor Hickel and then-Secretary Hickel. He tried to get an Arctic policy in 1977, was almost successful, and then departed the national scene. We have not been able to rekindle that. But I do know that the whole concept of the North Commission, and the concepts that he tried, as Secretary, blend in with what we have tried to continue.

I commend Senator Murkowski for his initiative in preparing this bill, and stepping in to try to bring it together as a national Federal policy. I think industry ought to view that as being a positive step, rather than a negative step. I welcome your review in that regard.

Mr. **Weaver**. Well, I think relative to a program which is trying to look at the long-term requirements for additional knowledge, from whatever body generates that knowledge, we certainly support that. Indeed, we have viewed that in the existing organizations that have focused on the need for Arctic research, there is something that we certainly support. Some of the provisions are of concern to us. Perhaps that has come across very strongly.

Senator **Stevens**. Well, we will look forward to try to see if we can work out the differences. Dr. Sackinger, I wonder if you can tell us for the record here whether you could judge our efforts in terms of research in ice dynamics, subsea permafrost, ice stresses on structures, other types of research, as compared to other Arctic rim countries. Are we, you know, keeping up with the Russians, with the Canadians, with Greenland, in terms of our research efforts on a Government basis?

Mr. **Sackinger**. Well, of course, that varies with each of the different subject areas, and let me just mention a few of those.

With respect to icebreaking vessel research, I would say that is much more advanced in Canada, and Scandanavia, and in Germany, and in the Soviet Union.

Now, with respect to practical commercial experience, with icebreaking tankers and cargo vessels, the Soviet Union has over 20 years of experience beyond that of the United States.

With respect to large-scale ice-resistant structures, research in Canada is several years ahead of the United States, and the reason is that leasing has been accomplished there, and there are substantial tax incentives for the industry there, which result in a de facto Canadian Government funding of the majority of the costs. And these have led to a succession of large-scale developmental structures, the use of icebreaking drill ships, and icebreaker research.

It should be admitted that technology transfer to the United States of these items of progress is quite likely, but it will be on a proprietary basis, of course. I would say that the United States is on roughly an equivalent footing with respect to research on ice properties, with Canada. There is an area in which the United States has taken a lead. That's in environmental assessment, and the associated research that goes with environmental assessment. In 1975, when the BLM started the OCS environmental assessment program, they began a very substantial program of research, and has cooperated with Canada on some projects. With respect to oil-spill cleanup technology in moving ice, ice-infested waters, I would say that we're in an embryonic stage in all of the northern countries, including the United States. And in terms of subsea permafrost, I would say that there's an equivalent amount of research been conducted in Canada and in the United States on that.

Senator **Stevens**. Do you see a need for us to do more, or those of us involved in the public sector, to complement the research being done by the private sector?

Mr. **Sackinger**. Yes, I do. I think that the distinction between the private and public sector research is something that has to be worked out on a case-by-case basis, as you develop the interfaces in specific disciplines. But certainly, the private sector should deal with specific design configurations, the conditions at specific sites of their proposed activities. On the other hand, federally sponsored research should certainly support the missions of the agencies, such as weather and ice forecasting, pollution prevention, safety structure accreditation, vessel inspection, environmental impact assessments, and the like. I think that it's unreasonable to expect the industry to do research in all those areas, and certainly they do not do research in all those areas.

Generally speaking, I think federally sponsored research should be concerned with fundamental data; testing programs which have broad application to resource development in the Arctic regions. These certainly would require several years to complete. The results would be provided in the public domain for timely use by both the industry and the Government. And I might mention some of the research advantages that the public would accrue.

For one thing, there's going to be more competition at the lease sales, because a good many of the uncertainties would be removed. There's likely to be higher bonus bids. There'll be a faster pace of development and production. There will be fewer regulatory delays, and quicker resolution of litigation. Generally, there's likely to be lower costs for offshore facilities, because overdesigns will be avoided, and this should translate into an ultimate lower cost to the consumer. And I would expect development of more of the marginal or small oil reserviors, which otherwise might just be ignored and left there.

Senator **Stevens**. Thank you. Mr. Hawley, do you think that if we had additional research, they might make similar breakthroughs in the small-scale mining area, as far as offshore areas are concerned?

Mr. **Hawley**. As far as offshore, or onshore?

Senator **Stevens**. I'm talking about the capability of developing mining technologies both onshore and offshore. Would this additional research give us the capability to make some breakthroughs in small-scale mining? I get the impression that most of our Arctic mining endeavors are major large-scale efforts, that we don't really have a small-scale technology base to deal with the Arctic. Is that wrong?

Mr. **Hawley**. No, I think it's right. I think that the significant things are going to be the large ventures, and probably the small technology that's appropriate will filter down, or those people are pretty much capable of solving their onsite specific problems. I think they have some regulatory problems, but they're technically capable of figuring things out.

Senator **Stevens**. The research base we're talking about really is not related to them?

Mr. **Hawley**. I don't think so. I think it's mostly large-scale development. Coal mining is such an area we need to know specifically what types of underground mining can be done in a area where the ground is frozen down to 2,000 feet, or something like that.

Senator STEVENS. Do you see any significant gaps in our research base, as far as mineral resources are concerned? The oil and gas industry is very much involved because they had the first major breakthrough, and they are more deeply involved in actual development now. Do we have a gap in terms of mineral resources that federally or publicly supported research ought to fill?

Mr. HAWLEY. We have one gap that's just due to land ownership, in that the only areas of land which will be assessed by the private sector are those State lands and open Federal lands, and native lands, which are open. And you have this large body of closed Federal lands which cannot be assessed, at least at the present, by anybody but the Federal Government. And there's a tremendous amount of scientific knowledge on mineral resources to be compiled on northern Alaska, all the way through the Arctic wildlife range, which is almost unknown, but yet has vast suspected resources.

Senator STEVENS. Ladies and gentlemen, I thank you very much for participating, and for presenting testimony that we will use as we consider this bill.

[The prepared statements of Messrs. Weaver, Hawley, and Sackinger follow:]

TESTIMONY BY
R. H. WEAVER, VICE PRESIDENT
ALASKA OIL AND GAS ASSOCIATION

ARCTIC RESEARCH BILL (S1562)
Fairbanks, Alaska
April 7, 1982

I AM RICHARD H. WEAVER, OPERATIONS MANAGER FOR EXXON IN ALASKA AND VICE PRESIDENT OF THE ALASKA OIL AND GAS ASSOCIATION. AND TODAY I AM SPEAKING ON BEHALF OF THE ASSOCIATION WHOSE 36 COMPANIES ARE ENGAGED IN OR CONTEMPLATING PETROLEUM OPERATIONS IN ALASKA. WE WOULD LIKE TO EXPRESS OUR APPRECIATION FOR HAVING THE OPPORTUNITY TO DISCUSS THE PROPOSED ARCTIC RESEARCH BILL, S1562. FROM AN EXAMINATION OF THE BILL IT WOULD APPEAR THAT THERE MAY BE A LACK OF AWARENESS OF THE BROAD, COMPREHENSIVE SCOPE OF EXISTING ARCTIC RESEARCH PROGRAMS BEING CONDUCTED BY INDUSTRY, GOVERNMENT, AND ACADEMIA. WE BELIEVE THAT THE CONTENTION THAT THE NATION IS SUFFERING FROM A DEARTH OF ARCTIC RESEARCH AND TECHNOLOGY AND THAT EFFORTS HAVE BEEN FRAGMENTED AND ACCORDED FAR TOO LOW A PRIORITY IS NOT CORRECT. MY DISCUSSION HERE TODAY WILL ENDEAVOR TO GIVE YOU A CAPSULE PICTURE OF THE DEPTH AND BREADTH OF CURRENT ARCTIC RESEARCH PROGRAMS WITH EMPHASIS ON THE PARTICULAR

PROGRAMS BEING CONDUCTED BY THE PETROLEUM INDUSTRY. I WILL ALSO BRIEFLY DISCUSS OUR POSITION ON CERTAIN PROVISIONS OF THE BILL ITSELF.

ARCTIC RESEARCH CONDUCTED BY THE FEDERAL GOVERNMENT

TO BEGIN WITH, I WOULD LIKE TO CALL ATTENTION TO THE RESEARCH PROGRAMS OF THE FEDERAL GOVERNMENT, SUCH AS THE EXTENSIVE PROGRAM BEING CONDUCTED UNDER THE OUTER CONTINENTAL SHELF ENVIRONMENTAL ASSESSMENT PROGRAM. THIS WORK IS BEING PERFORMED BY THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) UNDER CONTRACT TO THE BUREAU OF LAND MANAGEMENT OF THE DEPARTMENT OF THE INTERIOR. THE EMPHASIS OF THIS PROGRAM IS ON BIOLOGICAL AND SOCIOECONOMIC ISSUES RELATED TO FUTURE OUTER CONTINENTAL SHELF LEASE SALES. REPORTS OF THIS WORK, WHICH ARE VERY COMPREHENSIVE, ARE PROMPTLY AND WIDELY DISSEMINATED. ANOTHER FEDERAL RESEARCH GROUP, THE U.S. ARMY CORPS OF ENGINEERS COLD REGIONS RESEARCH AND ENGINEERING LABORATORY IN HANOVER, NEW HAMPSHIRE, IS HIGHLY

RESPECTED FOR BOTH ITS LABORATORY RESEARCH AND ITS FIELD WORK. ITS FIELD PROJECTS EMPHASIZE ICE MECHANICS AND PERMAFROST STUDIES, WHILE THE LABORATORY INCLUDES ICE BASINS FOR TESTING THE EFFECTS OF MOVING ICE ON MODELS OF SHIPS, HARBOR FACILITIES, AND OTHER STRUCTURES. IN ADDITION TO STUDIES OF THE PHYSICAL ASPECTS OF THE ARCTIC, THIS GROUP HAS CONDUCTED EXTENSIVE STUDIES OF THE BIOTA OF THE TUNDRA.

ARCTIC RESEARCH CONDUCTED BY ACADEMIC INSTITUTIONS

AMONG THE PROGRAMS CONDUCTED BY ACADEMIC INSTITUTIONS, THE UNIVERSITY OF ALASKA HAS CONDUCTED RESEARCH IN PERMAFROST, SEA ICE STRENGTH, AND MARINE BIOTA. IT IS ALSO RECOGNIZED FOR IT'S WORK IN PHYSICAL MARINE SCIENCE. THE UNIVERSITY OF WASHINGTON HAS CONDUCTED AN EXTENSIVE STUDY OF SEA ICE DYNAMICS. AS A POINT OF INTEREST, AND I'LL RETURN TO THIS POINT LATER, BOTH UNIVERSITIES HAVE USED THE NAVAL ARCTIC RESEARCH LABORATORY, NARL, AT BARROW FOR SUPPORT OF THEIR RESEARCH PROGRAMS.

PETROLEUM INDUSTRY ARCTIC RESEARCH

LET ME NOW DISCUSS THE ARCTIC R & D PROGRAMS BEING CONDUCTED BY THE PETROLEUM INDUSTRY. BECAUSE OF THE EXTENSIVE BIOLOGICAL RESEARCH BEING DONE UNDER THE GOVERNMENT PROGRAMS, THE INDUSTRY PROGRAMS PRIMARILY DEAL WITH THE PHYSICAL ASPECTS OF THE ARCTIC ENVIRONMENT SUCH AS ICE MECHANICS, OCEANOGRAPHY, AND METEOROLOGY. THE INDUSTRY HAS SPENT OR COMMITTED OVER $40 MILLION FOR 152 ARCTIC RESEARCH PROJECTS. THE PACE OF THESE PROJECTS CONTINUES TO INCREASE SUCH THAT 40 OF THEM ARE ACTIVE AT THIS TIME. AN EXTENSIVE BIBLIOGRAPHY OF ARCTIC RESEARCH PROJECTS WILL BE SUBMITTED FOR YOUR REVIEW AND WE WOULD APPRECIATE THIS DOCUMENT BEING INCLUDED IN THE RECORD OF THIS HEARING. DETAILS ON ANY OF THESE PROJECTS CAN BE MADE AVAILABLE. I WOULD LIKE TO TAKE A FEW MOMENTS NOW, HOWEVER, TO BRIEFLY DESCRIBE SEVERAL EXAMPLES OF THE INDUSTRY PROJECTS PRESENTLY UNDERWAY:

SHELL OIL COMPANY IS MANAGING A PROGRAM FOR THE DEVELOPMENT OF INSTRUMENTATION THAT WILL USE SONAR FROM AUTOMATED

INSTRUMENTATION ON THE OCEAN FLOOR TO PROFILE THE UNDERSIDE OF PACK ICE AND TO MEASURE MOVEMENT OF THE ICE PACK. THIS PROJECT COMPLEMENTS A NUMBER OF SEPARATE PROJECTS FOR MEASURING THE RATE OF MOVEMENT OF LAND-FAST ICE BY USING WIRELINE MEASUREMENT STATIONS.

SEVERAL PROJECTS FOR MEASURING THE STRENGTH OF SEA ICE ARE IN PROGRESS. ONE OF THESE, WHICH IS MANAGED BY EXXON, MEASURED THE STRENGTHS OF LARGE ICE BLOCKS ON-SITE IN THE ARCTIC. THESE LARGE SCALE MEASUREMENTS HAVE BEEN CORRELATED TO STRENGTH MEASUREMENTS OF SMALL SAMPLES COLLECTED IN THE ARCTIC AND SHIPPED TO ICE STRENGTH TESTING LABORATORIES. WITH THE RELATIONSHIPS KNOWN BETWEEN LARGE AND SMALL SCALE ICE STRENGTHS, WE CAN CONCENTRATE OUR EFFORTS ON SMALL SCALE SAMPLES, WHICH ARE CONSIDERABLY EASIER TO COLLECT AND TEST. UNDER OTHER PROJECTS, MODEL TESTS ARE BEING CONDUCTED IN ICE BASINS AT VARIOUS FACILITIES TO DETERMINE THE REACTION OF VARIOUS STRUCTURE SHAPES AND VESSELS TO THE FORCES OF MOVING PACK ICE. THE BERING SEA, WHERE SEVERAL LEASE SALES ARE SCHEDULED FOR THE NEAR FUTURE, HAS, UP UNTIL NOW, BEEN AN AREA OF RELATIVELY SPARSE METEOROLOGICAL AND OCEANOGRAPHIC DATA. UNDER A JOINT-INDUSTRY PROGRAM AND WITH THE COOPERATION OF NOAA, WE ARE GATHERING WEATHER AND DATA THROUGH A NETWORK OF LAND AND BUOY-MOUNTED WEATHER STATIONS AND RECEIVING THE DATA THROUGH NOAA'S WEATHER SATELLITE. THIS IS ONE OF THE MOST TECHNOLOGICALLY ADVANCED METERORОLOGICAL AND OCEANOGRAPHIC PROGRAMS EVER UNDERTAKEN. ALL THE WEATHER DATA IS AVAILABLE TO THE PUBLIC AND IS BEING INCORPORATED INTO WEATHER FORECASTS BY THE ANCHORAGE NATIONAL WEATHER SERVICE OFFICE.

SEVERAL PROJECTS ARE UNDERWAY FOR DESIGNING STRUCTURES FOR EXPLORATION AND PRODUCTION THAT WILL BE CAPABLE OF RESISTING MOVING PACK ICE IN THE BERING SEA AND IN THE SHEAR ZONE AND BEYOND IN THE BEAUFORT AND CHUKCHI SEAS. THESE DESIGNS WILL RELY HEAVILY ON THE ICE MOVEMENT AND STRENGTH MEASUREMENTS THAT I MENTIONED PREVIOUSLY SUPPLEMENTED BY MODEL TESTS THAT ARE BEING CONDUCTED ON THE VARIOUS SHAPES UNDER CONSIDERATION. TECHNOLOGY DEVELOPED IN THIS WORK WILL ALLOW US TO CONDUCT PETROLEUM

OPERATIONS IN ALL ARCTIC AREAS PRESENTLY SCHEDULED FOR LEASING IN A SAFE AND EFFICIENT MANNER.

REGARDING DISSEMINATION OF THE RESULTS OF THESE STUDIES, AOGA HAS AN ONGOING PROGRAM FOR CONVEYING ALL PROJECT REPORTS FOR WHICH CONFIDENTIALITY HAS EXPIRED TO THE FOLLOWING THREE ORGANIZATIONS: (1) ARCTIC ENVIRONMENTAL AND INFORMATION DATA CENTER IN ANCHORAGE, (2) THE U.S. ARMY COLD REGIONS RESEARCH AND ENGINEERING LABORATORY IN NEW HAMPSHIRE, AND (3) THE ARCTIC INSTITUTE OF NORTH AMERICA IN CALGARY, ALBERTA. (THROUGH THESE ORGANIZATIONS THE DATA IS AVAILABLE TO THE PUBLIC.)

BESIDES THESE COOPERATIVE INDUSTRY EFFORTS, EXTENSIVE ARCTIC RESEARCH PROGRAMS ARE BEING CONDUCTED BY THE INDIVIDUAL COMPANIES THAT CONTEMPLATE OPERATING IN THE ARCTIC. THE RESULTS OF MUCH OF THIS IN-HOUSE RESEARCH REACHES THE PUBLIC DOMAIN THROUGH PAPERS PRESENTED BY THE COMPANY TECHNICAL EXPERTS AT TECHNICAL MEETINGS OR PUBLISHED IN THE TECHNICAL LITERATURE. AN EXAMPLE OF THIS IS THE GRAVEL ISLAND SEMINAR CONDUCTED IN 1979 BY EXXON WHICH WAS

OPEN TO ANY INTERESTED PARTY. IN THIS SEMINAR, EXXON PRESENTED THE TECHNOLOGY FOR DESIGN OF GRAVEL EXPLORATION ISLANDS IN THE NEAR-SHORE BEAUFORT SEA.

IN ADDITION TO THE INDUSTRY-FUNDED RESEARCH BEING CONDUCTED IN THE UNITED STATES, OUR SCIENTIFIC COMMUNITY HAS ACCESS TO THE RESULTS OF ARCTIC RESEARCH PROJECTS BEING CONDUCTED BY THE CANADIAN GOVERNMENT AND BY CANADIAN PETROLEUM JOINT INDUSTRY GROUPS. ONE OF THESE GROUPS, THE ARCTIC PETROLEUM OPERATORS ASSOCIATION (APOA) HAS CONDUCTED 193 PROJECTS AT A COST OF $30 MILLION. U.S. COMPANIES OR THEIR CANADIAN AFFILIATES ARE FUNDING-PARTICIPANTS FOR MOST OF THESE PROJECTS. BECAUSE OF THE INTERCHANGE BETWEEN THE U.S. AND CANADIAN RESEARCHERS, AND BECAUSE CANADIAN REGULATIONS ARE LESS RESTRICTIVE THAN THE U.S. MARINE MAMMAL PROTECTION ACT, WHICH CONSIDERS JUST CAUSING A MARINE MAMMAL TO CHANGE COURSE TO BE THE EQUIVALENT OF TAKING IT, THE CANADIAN RESEARCHERS CAN DO MORE TO ACTUALLY OBSERVE THE EFFECTS OF VARIOUS OPERATIONS ON THE MAMMALS. THEIR WORK, THEREFORE, COMPLIMENTS THE RESEARCH BEING DONE IN ALASKA.

IN THE AREA OF BIOLOGICAL RESEARCH, SOHIO HAS MANAGED A JOINT-INDUSTRY PROJECT FOR COUNTING BOWHEAD WHALES IN THE CANADIAN ARCTIC TO GET DATA FOR ESTIMATING THE CURRENT BOWHEAD POPULATION. IN ADDITION A GROUP OF COMPANIES JOINED IN THE FUNDING OF AN ESKIMO-MANAGED BOWHEAD WHALE CENSUS OFF POINT BARROW LAST SUMMER. INDUSTRY STUDIES HAVE COMPLIMENTED THOSE OF THE BLM, IN MAKING OBSERVATIONS OF THE BEHAVIOR OF BOWHEAD WHALES IN THE VICINITY OF DREDGING OPERATIONS, BOAT TRAFFIC, DRILLING AND SEISMIC EXPLORATION IN THE CANADIAN BEAUFORT. NONE OF THESE ACTIVITIES CREATED SUFFICIENT DISTURBANCE TO CAUSE THE WHALES TO EITHER VACATE AN AREA OR TO SIGNIFICANTLY ALTER THEIR BEHAVIOR.

SEVERAL COMPANIES HAVE BEEN ACTIVE IN DEVELOPING NEW METHODS FOR CLEANING UP OILSPILLS ON AND UNDER THE ARCTIC ICE. AMONG THESE DEVELOPMENTS ARE THE ARCAT SKIMMER, WHICH IS A CATAMARAN-TYPE VESSEL DESIGNED FOR OPERATING IN AREAS OF BROKEN ICE. TESTS HAVE ALSO BEEN RUN TO ASSESS THE EFFECTIVENESS OF USING CHEMICALS FOR DISPERSING SPILLS IN COLD WATER.

CONSIDERABLE CROSS-COMMUNICATION OCCURS BETWEEN INDUSTRY, GOVERNMENT, AND ACADEMIA DURING THE SYNTHESIS MEETINGS AND ENVIRONMENTAL IMPACT STATEMENT HEARINGS HELD FOR PROSPECTIVE LEASE SALE AREAS UNDER THE AUSPICES OF THE BUREAU OF LAND MANAGEMENT. IN ADDITION, REPRESENTATIVES OF GOVERNMENT OFTEN ATTEND THE BI-MONTHLY MEETINGS OF AOGA'S LEASE-SALE PLANNING AND RESEARCH TECHNICAL SUBCOMMITTEE WHERE THE JOINT-INDUSTRY PROJECTS ARE REVIEWED.

IN THIS BRIEF OVERVIEW I WANTED TO SHOW THAT THERE IS A GREAT DEAL OF ARCTIC RESEARCH UNDERWAY AND THAT THE RESULTS OF THIS RESEARCH ARE BEING DISSEMINATED TO THE SCIENTIFIC, TECHNICAL AND ACADEMIC COMMUNITIES, EVEN THOUGH GOVERNMENT MAY NOT ALWAYS BE FULLY AWARE OF THESE ACTIVITIES.

DISCUSSION OF THE ARCTIC RESEARCH BILL

NOW I WOULD LIKE TO DISCUSS ARCTIC RESEARCH BILL THAT IS THE TOPIC OF TODAY'S MEETING. ALTHOUGH WE WOULD SUPPORT STEPS TO

ENHANCE AND STREAMLINE EXISTING COMMUNICATION AND COORDINATION OF ARCTIC RESEARCH ACTIVITIES, WE DO NOT SEE A NEED FOR THE ESTABLISHMENT OF A HIGH LEVEL ARCTIC RESEARCH COUNCIL AS PROPOSED IN THIS BILL. FURTHER, WE DO NOT FEEL THAT, GIVEN THE CURRENT LEVEL OF INDUSTRY FUNDED RESEARCH IN BOTH THE U.S. AND CANADA, THERE IS A NEED TO COMMIT ANNUALLY UP TO $25 MILLION OF FEDERAL REVENUE TO ARCTIC RESEARCH. MY EARLIER COMMENTS HAVE INDICATED THE BREADTH AND DEPTH OF THE RESEARCH PROGRAMS THAT ARE BEING CONDUCTED. WE FEEL THAT THE ADDITION OF ANOTHER LAYER OF CONTROL TO A PROCESS THAT IS ALREADY FUNCTIONING WELL COULD INHIBIT THE FLEXIBILITY AND RESPONSIVENESS OF THE CURRENT PROGRAMS.

AS AN ALTERNATIVE, WE WOULD PROPOSE THE ENCOURAGEMENT OF THE GOVERNMENTAL AGENCIES RESPONSIBLE FOR RESEARCH TO SOLICIT INDUSTRY INPUT AS TO THE USEFULNESS OF THEIR PROPOSED PROGRAMS AND TO WORK COOPERATIVELY WITH INDUSTRY TO BETTER IDENTIFY THE ROLES THAT EACH SHOULD HAVE IN THE CONDUCT OF ARCTIC RESEARCH. A WORKING LEVEL COMMITTEE, WITH A MAXIMUM MEMBERSHIP OF ABOUT TEN PEOPLE, COULD BE FORMED WITH SEVERAL MEMBERS EACH FROM

GOVERNMENT, INDUSTRY, AND ACADEMIA TO DISCUSS PLANS FOR ARCTIC RESEARCH AND TO OPTIMIZE ON A STRICTLY VOLUNTARY BASIS THE ROLE OF EACH OF THE THREE SECTORS. THIS STANDING COMMITTEE COULD FUNCTION IN A SIMILAR MANNER AS THE EFFECTIVE AD-HOC GROUPS THAT HAVE BEEN ASSEMBLED FOR OCS PRE-SALE SYNTHESIS MEETINGS.

AN ASPECT OF THE PROPOSED BILL THAT IS OF PARTICULAR CONCERN TO INDUSTRY IS THE PROVISION THAT REQUIRES A PERMIT APPLICANT TO FUND OR PERFORM ALL RESEARCH REQUIRED TO ANSWER ANY ENVIRONMENTAL QUESTIONS RAISED BY THE PERMIT APPLICATION. THE JUDGEMENT OF JUST HOW MUCH RESEARCH WOULD BE REQUIRED WOULD BE MADE BY THE AGENCY RESPONSIBLE FOR ISSUING THE PERMIT. OUR CONCERN HERE IS THAT WE COULD ENCOUNTER THE SITUATION WHERE EVERY CONCEIVABLE QUESTION AND EVERY CONCEIVABLE FEAR INDEPENDENT OF THEIR SIGNIFICANCE OF BASIS, WOULD HAVE TO BE ANSWERED. WE COULD EXPECT AGENCY SCIENTISTS' REQUIREMENTS FOR PROLONGED, ESOTERIC STUDIES TO UNNECESSARILY OBSTRUCT THE EXPEDITIOUS DEVELOPMENT OF ARCTIC OIL AND GAS RESOURCES. THIS SITUATION WOULD COMPOUND THE EXISTING REGULATORY SNARL BY FURTHER RETARDING THE PERMITTING

PROCESS. THE DISRUPTIVE EFFECTS OF PERMITTING DELAYS BASED ON UNSUBSTANTIATED FEARS OF ENVIRONMENTAL IMPACTS WERE CITED IN THE NATIONAL PETROLEUM COUNCIL'S 1981 STUDY OF ARCTIC OIL AND GAS RESOURCES AS BEING MAJOR ROADBLOCKS TO PETROLEUM DEVELOPMENT IN THE ARCTIC. THIS PROVISION COULD RESULT IN DELAY OF ARCTIC EXPLORATION AND INCREASE COSTS WITH NO INCREASE IN SAFETY OR ENVIRONMENTAL PROTECTION.

FINALLY, IT WOULD APPEAR THAT ONE OF THE PURPOSES OF THIS BILL IS TO REVIVE THE OPERATION OF THE NAVAL ARCTIC RESEARCH LABORATORY (NARL), IN BARROW. ALTHOUGH WE DON'T BELIEVE THAT THAT FACILITY IS NEEDED AS A MAJOR RESEARCH CENTER FOR COORDINATION OF ARCTIC RESEARCH, WE DO AGREE THAT THAT FACILITY WOULD BE EXTREMELY USEFUL AS A FIELD EXPERIMENT STATION AND LOGISTICAL SUPPORT BASE FOR THE RESEARCH PERFORMING ENTITIES, INCLUDING ACADEMIA, GOVERNMENT, AND INDUSTRY ON AN APPROPRIATE COST-SHARING BASIS. WE STRONGLY RECOMMEND THAT MEANS BE FOUND FOR ACCOMPLISHING THE REESTABLISHMENT OF NARL AS A LOGISTIC BASE BUT WITHOUT ENDOWING

IT WITH AUTHORITY FOR INDEPENDENTLY COORDINATING OR DIRECTING RESEARCH PROGRAMS.

BEFORE CLOSING I WOULD NOTE THAT THE AOGA MEMBER COMPANIES ARE ALSO CONCERNED WITH THE SOCIOECONOMIC ISSUES THAT ARE BEING RAISED BY THE PROSPECT OF PETROLEUM ACTIVITY IN THE COASTAL AREAS AND OFFSHORE ALASKA. AOGA AND SEVERAL INDIVIDUAL OPERATING COMPANIES HAVE BEEN CONDUCTING COMMUNICATION PROGRAMS THAT NOT ONLY CONVEY THE STATE OF INDUSTRY'S TECHNICAL AND OPERATING COMPETENCE TO LOCAL CITIZENS, BUT ALSO PROVIDE THE INDUSTRY INFORMATION ON LOCAL CONDITIONS AND CONCERNS. THESE PROGRAMS ARE BUILDING A BASE OF DIALOGUE WITH LOCAL INTERESTS THAT WILL FORM A FOUNDATION OF MUTUAL CONFIDENCE FOR DEVELOPING FUTURE BUSINESS RELATIONSHIPS.

IN SUMMARY, MR. CHAIRMAN, THE ALASKA OIL AND GAS ASSOCIATION BELIEVES THAT THE RECORD SHOWS THAT THERE IS A WEALTH OF ARCTIC RESEARCH WHICH HAS BEEN AND IS PRESENTLY BEING CONDUCTED BY INDUSTRY, GOVERNMENT AND ACADEMIA. THE RESULTS OF THIS RESEARCH

ARE BEING EFFECTIVELY DISSEMINATED AMONG THOSE INVOLVED IN ARCTIC RESEARCH AND TECHNOLOGY DEVELOPMENT, AND RESULTS ARE BEING APPLIED TODAY IN BOTH THE ALASKAN AND CANADIAN BEAUFORT SEA. AOGA WOULD BE PLEASED TO WORK WITH YOU AND YOUR STAFF TO PROVIDE THE OPPORTUNITY TO SEE SPECIFIC RESEARCH PROGRAMS AND TODAYS APPLICATIONS OF OUR ARCTIC TECHNOLOGY. WE SUPPORT YOUR INTEREST IN FURTHERING ARCTIC RESEARCH BUT DO NOT BELIEVE THAT S1562 IS NECESSARY TO ACHIEVE THAT END.

WE THANK YOU FOR THIS OPPORTUNITY TO PRESENT OUR VIEWS, AND WILL BE HAPPY TO ANSWER ANY QUESTIONS YOU MAY HAVE.

SPEECH/008/es

ARCTIC SCIENCE POLICY: STATEMENT

April 7, 1982

C. C. Hawley

Work mainly over the last decade has confirmed major metallic reserves in Arctic Alaska. Reserves in the Ambler belt on the south flank of the Brooks Range contain in excess of 50,000,000 tons of high grade zinc-copper ore; in the north flank belt, including the Red Dog deposit, the proven and well indicated potential reserves would exceed 100,000,000 tons of high-grade zinc-lead-barite ores. These reserves plus an extensive coal resource and existing and projected oil and gas work insures a tremendous mineral impact in the Arctic.

Many of the detailed studies relative to mineral development will and should be borne entirely by the private sector, but because the projects are extensive enough that they cross jurisdictional boundaries and involve coordination between industry, rural Alaskans, several federal agencies, and the State of Alaska, larger planning and research efforts are entirely appropriate. Further, the desirable basic research effort on climate, environmental effects, marine conditions, and other factors of present uncertainty reasonably will only be borne by a coordinated and planned public resource agency effort.

As various participants have pointed out, much of the basic work is not being carried out and is certainly not as well coordinated as it might be under a strong Arctic Science Policy directive. The proposal embodied by S. 1562 would get Arctic research back on track, with a sufficient funding base that significant research activities could be carried out.

PREPARED STATEMENT OF WILLIAM M. SACKINGER

My name is William Sackinger, and I am a member of the faculty of the Geophysical Institute at the University of Alaska. However, I do not represent the University today; my testimony is my own individual viewpoint.

Thank you for inviting me to appear before you to discuss the crucial role of applied research in the timely development of the oil and mineral resources of Alaska. Before I delve into details it should be pointed out that other existing and growing Alaskan industries, such as fishing, agriculture, and timber, all contribute to national and world needs for food and building materials. The importance of applied research on Arctic problems faced by these industries cannot be overstated, for renewable resources such as these represent the economic foundation of our society.

The importance of a stable domestic source of petroleum has been obvious since 1973. A recent report by the National Petroleum Council Committee on Arctic Oil and Gas Resources has estimated that the North Slope together with the offshore areas in the Beaufort, Chukchi and Bering Seas contain 24 billion barrels of oil and 109 trillion cubic feet of gas, waiting to be discovered, developed, and delivered to the American consumer. These are mean values, involving twenty prospective regions; the discovery of oil in at least several of these frontier provinces is virtually certain. Using today's values this national resource is worth 1.26 trillion dollars. The optimum recovery of this petroleum resource must command serious national attention, and the petroleum-related activities must be conducted in a safe, prudent, and environmentally sensitive manner consistent with law and national policy.

The petroleum industry has come a long way in the past two decades, successfully developing the Prudhoe Bay reservoir, producing from the Cook Inlet resources, and building the Trans-Alaska pipeline. Technological challenges had to be overcome in each project, and industry engineers built upon the results of earlier basic and applied research on permafrost and sea ice in order to produce preliminary designs for these projects.

The most serious technological challenge in the Arctic offshore is the destructive power of the moving, shifting pack ice. Exploration drilling in the Bering and parts of the Chukchi Sea can be accomplished during the benign, ice-free summer interval; exploration drilling within the 20-meter water depth contour of the Beaufort Sea can and has been done successfully in the winter months, when ice motion in that area is usually quite limited. However, production facilities must be designed for year-round operations, and the statistical probability of extremely severe ice damaging events, even if they may occur only once in the life of the oil field, should be considered in the design process. The severity of ice hazards is dependent upon the ice thickness and type, the speed of ice movements, and the mechanical strength properties of the ice. All of these parameters are subject to statistical fluctuations, as they occur in nature, and a sizable set of measurements is required to define the extremely severe ice conditions (such as the event which occurs once in 100 years).

Exploration islands in the Beaufort Sea have successfully withstood annual ice, formed within one year, with thicknesses ranging up to about six feet. A greater hazard is multi-year pack ice several years old, formed from large annual ice ridges. Multi-year ice twenty feet thick is not uncommon in the pack, and thicknesses up to 150 feet have been inferred from ice scour marks on the sea floor. This thick ice can ground out on the sea floor and stop moving before it intrudes into shallow water, but details of that beneficial process, which can shield offshore production islands and structures, remain to be quantified. Conservative designers are likely to allow for multi-year ice thicknesses roughly equal to the water depth at the installation, but further research may reveal that this is not necessary. As water depths greater than 60 feet are offered for lease in the Chukchi and Beaufort Seas, knowledge of ice conditions will be an important factor in deciding whether reservoirs can be developed economically. The use of traditional, massive artificial islands is very costly in deeper water, and concepts such as retained-fill islands with concrete caisson walls are just now being implemented. The limits of the technical and economic feasibility of these structures, and the extreme ice conditions to be expected, will affect the offshore bidding, the exploration rates, and the field development rates in the Beaufort and Chukchi Seas. A high cost will be the penalty of uncertainty, a cost which will ultimately be paid by the American public, either as taxpayers or as consumers. A specific benefit of the Arctic Research and Policy Act would be to reduce these costs of uncertainty, by providing for research which quantifies the technical obstacles to offshore petroleum development. Ice research has been specifically recognized in the recent report by the National Petroleum Council as an important subject for governmental research. The Arctic Research and Policy Act could help implement that recommendation. The meetings and reports of the Alaska Council on Science and Technology have also recognized sea ice research as a key element in the development of western Alaska.

Marine transportation of produced oil, gas, and minerals is quite likely for regions of the Bering and Chukchi Seas. However, the trans-Alaska pipeline is likely to be used for production of oil from the North Slope and the Beaufort Sea. Ice-breaking supply boats and medium-size icebreaking oil tankers are feasible for the Bering Sea. Winter marine transport has been carried out in the Baltic for decades, in ice conditions similar to those in the Bering Sea. Recent novel and improved icebreaker trials in Canada and in Germany have shown us that there is an excellent prognosis for winter commercial icebreaker operations in the Chukchi Sea. The voyage of the Manhattan over a decade ago showed that such activities are possible. The ice severity, in the form of thickness extremes, affects the reliability and the economics of this marine transportation, on a day-to-day, mile-by-mile basis. Methods of ice forecasting and reconnaissance need to be improved to make this commercially feasible in the Chukchi Sea. The extraction of large natural gas reserves in the Arctic offshore, using LNG icebreaking tankers, is technologically within reach, and the economics depend upon ice. Because of shallow water near the shore, offshore loading terminals will be required for medium and large ships, and ice management at berthing areas will be necessary. The movement of minerals and of coal from the coasts of the Bering and Chukchi Seas, in icebreaking bulk carriers, is technologically within reach as well. Federally-funded research on ice, made possible by the Arctic Research and Policy Act, would remove the single existing technical barrier to oil and mineral development in the western Arctic. Federally-sponsored research should proceed in cooperation with industrial and State-funded research, complementing it in a manner consistent with Federal policy objectives. Major industrial investments, and the delivery of minerals and petroleum to the American public, will take place after these uncertainties are resolved.

One consequence of our free-enterprise system, as applied in this case, is that only the very largest corporations can afford to invest in long-term research on ice problems, especially in view of the additional uncertainty in bidding for leases and in drilling for oil. Knowledge of the ice environment, in the public domain, will lead to more and higher bonus bids for offshore tracts, returning the research investment to the treasury, and facilitating development.

The dual governmental mission of ensuring an effective and economic use of petroleum and mineral resources, while establishing appropriate standards for acceptable risk, human safety, and environmental protection, has been established by the Congress. Regulations have been promolgated to achieve these ends. Knowledge of the environmental hazards, and of the detailed sensitivities of environmental ecosystems, is needed for these regulations to be realistic, as Congress intended. In the absence of such knowledge, regulatory decisions tend to be overly conservative, slowing resource development. The Arctic Research and Policy Act, applied broadly, could fill research gaps in all Arctic areas of importance to the regulatory mission of the executive branch. Resource development would be expedited, as decisions would be made in the light of a more adequate information base. Existing programs of Arctic research are, for the most part, mission-oriented, and the coordination of these could be enhanced by the actions of the Arctic Research Council as described in the proposed Act. Gaps between the programs of the mission-oriented agencies could be filled by the Arctic Research Fund. The Arctic Research Council should be charged with a review of the Arctic programs and budgets of mission-oriented agencies, to strengthen them in crucial areas as necessary.

Timely development of the petroleum and mineral resources of Alaska, a matter of high priority, depends upon detailed knowledge of those special factors imposed by nature which face the industrial design teams and the regulatory agencies. A flow of this essential information into the hands of these users will take place if the Arctic Research and Policy Bill is enacted. In my opinion, this bill is in the national interest, and it has my unqualified support.

Senator STEVENS. There will be a further hearing in Washington on Senator Murkowski's bill by our committee. I believe it's June 17.

There will be public notices of that hearing. We thank all of you who did participate in this hearing, and all who helped to arrange it, and the University of Alaska for their courtesy in making space available so we could hold a hearing. Thank you very much.

The hearing will be adjourned.

[Whereupon the committee recessed, to reconvene subject to the call of the Chair.]

ARCTIC RESEARCH AND POLICY ACT OF 1981

THURSDAY, JUNE 17, 1982

U.S. Senate,
Committee on Governmental Affairs,
Washington, D.C.

The committee met at 10 a.m., in room 3302, Dirksen Senate Office Building, Hon. Ted Stevens, presiding.

Present: Senators Stevens and Jackson.

Also present: Senator Murkowski.

Staff present: Tonja Musko, staff attorney to Senator Stevens, David Garman, legislative assistant to Senator Murkowski, David Markey, administrative assistant to Senator Murkowski, and Linda Mason, professional staff member, Committee on Energy and National Resources, accompanying Senator Jackson.

OPENING STATEMENT OF SENATOR STEVENS

Senator **Stevens**. Good morning. This morning we have a hearing on the Arctic Research and Policy Act which has been introduced by Senator Murkowski and cosponsored by Senator Jackson and me.

I have an opening statement concerning the hearing that we had in the past and the problems of the Federal Government in this area.

Then I want to give an opportunity to the other two sponsors of the bill to make their opening statements. But first I want to state that I am extremely disappointed at the Office of Management and Budget. As a matter of fact, I had seriously given consideration to canceling this hearing because of the action that OMB has taken in the last few days to direct the State Department and the Coast Guard and others not to testify on this bill.

I find that appalling and I understand the problem of coordination of comments of the administration. But to use the power of the Office of Management and Budget to strike at the heart of the scientific community, I think, is going much too far. I would have canceled this hearing but for the fact that our Lieutenant Governor and others have come a long distance to testify, and I believe they should be given that opportunity. But I intend to take it up with Mr. Stockman and if we don't get satisfaction from Mr. Stockman, I am going to ask for a meeting with the President. I do not believe that the Office of Management and Budget should get involved in the formulation of scientific policy. And that is what we are talking about.

[Senator Stevens' prepared statement follows:]

PREPARED STATEMENT OF SENATOR TED STEVENS

For the past twenty years, the scientific community and the federal government have attempted, time and time again, to formulate an urgently needed national Arctic science policy. All of those attempts have failed. The Arctic Research and Policy Act, on which we will be hearing testimony today, is the first Congressional effort to address national needs in the Arctic.

Witnesses at our Fairbanks hearing stated that national and international coordination of Arctic science has been sporadic, piece-meal and short term. More shocking yet, of all countries bordering on the Arctic, the United States stands alone in lacking a national institution, laboratory, or any other organization devoted to sustained planning and support of Arctic research.

Why has our country lagged so far behind other circumpolar nations in giving proper emphasis to a clearly defined Arctic policy? Part of the reason is a long and troubled history of interagency conflicts over jurisdictional boundaries. That history is the major reason why only two federal agencies out of seven who were invited to testify will appear before you today. These two agencies happen to oppose the bill.

Let us not underestimate the price of interagency conflict—not just in terms of the waste of federal dollars on duplicative research—but also in the arena of world opinion. To the other circumpolar nations, the fragmented, embattled nature of our current Arctic programs projects an image of weakness. The state of U.S. foreign policy in the Arctic is practically non-existent, while the Soviet Union is pursuing an aggressive, coordinated Arctic science policy emphasizing international technology transfer. As just one example, a recent article in the Journal of Commerce reported that the U.S.S.R. has an on-going research project with Finland to explore energy potential on the outer continental shelf of the Arctic Ocean.

The most recent attempt by the Executive Branch to overcome the serious time and technology lags that plague U.S. Arctic policy was spearheaded by the State Department. In the first few months of this year, the Interagency Arctic Policy Group tried to reach a consensus among ten federal agencies reaffirming the commitment of the United States to an Arctic policy set forth in a National Security Decision Memorandum of 1971. That attempt was quashed because of an interagency conflict over jurisdiction, and with it the brightest prospect for an Arctic policy in years. The federal agency witnesses wil tell you today that Arctic research coordination can and should be handled administratively through existing channels. But history clearly shows that this procedure has not been effective.

Because of our country's vital and immediate interests in the Arctic, it is also a matter of great personal concern to me that the Office of Management and Budget has dissuaded three of the most directly involved agencies from testifying today.

There are two publications available outside the hearing room that I urge you to read carefully. The first is a report by the General Accounting Office identifying a critical need for long-range basic science research and for coordination of existing projects. The GAO report concludes that the Arctic Research and Policy Act would be a positive step forward in addressing important federal concerns with energy development in the Arctic.

Also available is a report on research needs in the Arctic by the Office of Technology Assessment. Dr. Bill Davis of OTA is here today; we appreciate his efforts and those of the rest of the OTA staff in providing this timely analysis. The OTA report unequivocably demonstrates that a stronger emphasis on Arctic research is essential to the realization of this country's goals in the areas of energy and commerce.

At the first hearing on this bill in Fairbanks, we received strong support from the scientific community, the academic community, Native groups and state and local politicians. My office has received several letters from scientists all over the country applauding this policy effort. In addition, several members of the Alaska State Legislature have endorsed this bill. Today you will hear from the State of Alaska, an international Native group, two scientists—a geophysicist and the other an anthropologist—and a representative of the largest oil and gas developer in the American Arctic. All will testify in favor of the Arctic Research and Policy Act. Clearly, legislation that has received fervent support from such diverse groups is worthy of serious consideration by our federal government.

We have waited a long time for an Arctic science policy. Congress must put into place the cornerstone of a national science policy so that the United States can take its place among the other circumpolar nations in the state of its Arctic technology and in the strength and coherence of its arctic policy.

Let me close by saying that this legislation is very important to me, to my state, and to this country. I thank Senator Murkowski for introducing it and Senator Jackson for cosponsoring it. I look forward to working hard for its passage.

Senator STEVENS. Senator Murkowski, Senator Jackson, if you have opening statements, I will yield to you.

Senator MURKOWSKI. I would defer to Senator Jackson because he has a tight time schedule.

OPENING STATEMENT OF SENATOR JACKSON

Senator JACKSON. Thank you, Mr. Chairman.

I want to commend you and Senator Murkowski for taking the leadership in introducing this legislation. I want to say that I am pleased that the committee is holding these hearings on the Arctic Research and Policy Act, S. 1562.

As a cosponsor of the bill and the substitute amendment before us today, I hope the committee will report favorably on the bill soon. There clearly is a need for a comprehensive national science policy for the Arctic. As a nation we have neglected this area where we have a very direct and diverse national interest.

I well recall working with Ernest Gruening on Arctic research when I was a member of the House Appropriations Committee during the late 1940's and early 1950's. During this time, the Naval Arctic Research Laboratory was established at Point Barrow.

In the 1960's, I encouraged then-Senator Bob Bartlett and Joe Fitzgerald, chairman of the unique Federal Field Committee for Development Planning in Alaska, to develop an Arctic policy. While a policy statement was developed and submitted to President Johnson in 1968, he did not act on it before leaving office.

There were various other initiatives during the 1970's but none addressed Arctic research in a comprehensive manner. Ironically, it was the Navy's decision to close down the Naval Arctic Research Lab (NARL) that has sparked a renewal of congressional interest in Arctic research.

Section 1007 of the Alaska National Interest Lands Conservation Act directed the Secretaries of the Interior, Defense and Energy to review and make recommendations on: one, the need for redirecting U.S. Arctic research policy, and; two, the role of NARL facilities in developing and implementing that policy.

That study has been completed. It points out that: one scientific information needs on important issues are accelerating in the Arctic; and; two special circumstances exist which make Arctic research politically sensitive and relatively expensive and difficult to conduct.

The study concludes that creation of a tightly coordinated Arctic research program could yield information that would benefit the national interest.

There are three critical bases for an Arctic research program. These are: one, sustained funding; two, expert advice on program planning and management, and; three, an information center to serve as a repository of information and to quickly and efficiently disseminate the results of research to the public.

Mr. Chairman, I believe amendment No. 1453 goes a long way toward establishing this much-needed program. I am looking forward to working with you and Senator Murkowski to perfect it further and to get it enacted into law.

Finally, let me say that OMB is acting just like they have under previous administrations. They love to engage in censorship.

I must make a point here that the Congress is entitled to get honest advice from the various agencies. I think we are old enough and big enough to decide whether we should go forward with legislation.

I would remind my colleagues too that the largest source of oil supply for the United States is above the Arctic Circle. It is Alaska. We look to Alaska for the development of on-going reserves. Arctic research plays a very important part in developing the kind of techniques that we need to work in the Arctic. And the great issues that face the world in terms of national security are in the northern latitudes. That is where the big problems lie, in development, Mr. Chairman, of both energy and national security.

We are woefully weak in this area. The Soviets for decades have spent a lot of money on Arctic research and it becomes a very, very important issue when you are developing energy supplies as they are now in Siberia. As we will find out more and more in the future, Arctic science is important because most of the experts point out that it is in the Arctic where most of the oil and gas fields are that are likely to be developed.

This legislation will aid and abet those activities in coming up with answers that are very difficult when one is dealing with an area in which we have had very little experience in engineering terms and in terms of development.

We made clear in our national Alaska Lands bill that this was to be given high priority and it was a part of that legislation.

So I want to say that I would like to work with the chairman and Senator Murkowski in any way we can to get the best evidence up here without censorship.

It is ridiculous to say that we cannot have the advice of the agencies of the Government because it is going to violate some policy. When the first oil cutoff occurs in the Middle East, they will want to know how we can get more oil out of Alaska. Bureaucrats down in OMB in every administration are the biggest bunch of sycophants that have ever been produced by an organized government. They love to accommodate to whomever is in power. They can shift just as fast as the electorate. Sometimes they are a little ahead of them. I don't think we need censored advice, Mr. Chairman. And this applies to all administrations.

Senator STEVENS. Thank you, very much, Senator.

OPENING STATEMENT OF SENATOR MURKOWSKI

Senator MURKOWSKI. Thank you very much, Senator Jackson.

Mr. Chairman, I am certainly pleased to be here this morning to participate on a subject of great importance to our entire Nation, the need to create and implement a comprehensive national policy with respect to Arctic scientific research. We are all aware of the increased attention of the Arctic, particularly the Alaskan Arctic, has received over the past several years. This attention is well deserved in light of the fact that protection and development of the Alaskan Arctic are tied to the future of our Nation.

Indeed it is anticipated that perhaps as much as half of our Nation's future domestic oil supply may come from Alaska and its offshore fields. At the same time, we must insure that this development is undertaken in a reasonable, responsible manner that minimizes environmental disruption. I believe we can develop Alaska's renewable and nonrenewable resources while protecting fragile Arctic ecosystems from the adverse impacts of that development. But we cannot do it, Mr. Chairman, without a full and complete understanding of the Arctic—an understanding and appreciation that we do not current possess.

As any scientist will tell you, the dynamic understanding of any problem or phenomenon can only be built upon the foundation of a solid data base. Simply put, tomorrow's "solutions" are based on today's collection of data. Today, the United States is performing a variety of research in the Arctic—but it is narrowly focused, duplicative, uncoordinated, and fragmented. As a result, there are large gaps in our knowledge. The interdisciplinary research that does not lie within the purview of a single Federal agency is being ignored because there is no coordination or policy guidance.

Mr. Chairman, I have, along with Senator Jackson and yourself, introduced this legislation that will help correct years of uncoordinated scientific effort in the Arctic. We are not alone in our recognition of the problem. I am pleased to state for the record that this morning, the General Accounting Office released a report entitled, "Developing Alaska's Energy Resources: Actions Needed To Stimulate Research and Improve Wetlands Permit Processing." [1] This report repeatedly stresses the need to fill the existing gaps in our knowledge of the Arctic and coordinate our research efforts in the region if we intend to develop the resources of the Alaskan Arctic wisely. To quote from the report's digest:

> Alaska's Federal lands are rich in energy, wildlife, and scenic resources. Energy exploration and development in this unique environment has given rise to elaborate, costly, and sometimes controversial measures designed to minimize negative impacts. Additional research is needed to evaluate the effect energy exploration and development has had on Alaskan Federal lands * * * The research itself is costly, however, and should be planned and coordinated with existing efforts * * * (GAO found that) costly and controversial restrictions (are) being widely applied to energy exploration in the Arctic * * * (and that) inadequate research exists to support either the imposition or removal of these restrictions * * * [These) findings are particularly pertinent to the Congress in its consideration of recently proposed legislation with regard to Arctic research. S. 1562 would prioritize, fund and coordinate Arctic research. Thus, it could help fill the research gaps identified in this and previous reports * * *

I commend the GAO on its issuance of this timely report.

Mr. Chairman, S. 1562 as proposed to be amended by Senate Amendment No. 1453 will create the mechanism to create and implement the comprehensive Arctic research policy that we must have if we are going to approach resource development in a responsible manner. Our bill would create a two-tiered council/commission to create the comprehensive guiding policy and insure its implementation. The bill would also establish a central "clearinghouse" for the collection and retrieval of scientific data related to the Arctic. Finally, the bill would earmark a small percentage of

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[1] See p. 276.

Federal revenues from oil and gas leasing in the onshore and offshore Arctic for the funding of research designed to fill the gaps in our knowledge of the Arctic.

Mr. Chairman, let me respond to a question that may have arisen in the minds of some of the members of the committee; specifically, why is legislation needed to address this problem? Why can't we handle this problem administratively? These questions can best be answered by looking at the history of the attempts to create a comprehensive Arctic research policy.

Senator Jackson, I particularly appreciate your comments regarding the late Senator Gruening. You and Senator Stevens will recall that back in the 1960's Senator Bob Bartlett, a member of the Senate Appropriations Committee, noted a disparity between the funding the United States directed toward the Antarctic compared with the Arctic.

It is interesting to look at the comparison today. In 1982 we spent $67 million in Antarctica and $5.8 million in Arctic research.

It is noteworthy that we are directing a significantly greater amount of funding toward scientific research in the Antarctic. Really what we are doing now is keeping up with the Jones's so to speak. There is very little return on that investment. We even have a scientific research policy in the Antarctic, mandated by administration action—OMB Circular A-51. On the other hand, all attempts to administratively create and implement an Arctic science policy dating back to the 1960's have failed. After a 3-year effort, a U.S. policy statement agreed to by all concerned Federal agencies was still sitting unsigned on President Johnson's desk when he left office in 1968.

That same year, at the request of the Department of State, the Office of Science and Technology and the Federal Council of Science and Technology, the Interagency Arctic Research Coordinating Committee (IARCC) was established to insure the sound development and coordination of Federal research programs in the Arctic. In the absence of a guiding research policy, the IARCC foundered and was disbanded in 1978.

In 1971, the National Security Council adopted an instrument—NSD memorandum 144—to create an Interagency Arctic Policy Group to be established for a development of a coordinated plan for scientific research in and on the Arctic. This memorandum was reaffirmed by NSD memorandum 202 in 1973. Despite the fact that these instruments mandated the creation of an Arctic research policy, no such policy exists today. As the study of U.S. Arctic research policy, also known as the 1007 report, states on page 9:

> NSDMs [National Security Decision Memoranda] 144 and 202 definitely stated a U.S. desire to develop a coordinated plan for Arctic research, but investigation shows that the intentions of the memoranda have never been implemented to define mechanisms for the funding and management of Arctic research * * * the U.S. lacks an explicit Arctic research policy and, therefore, does not have a tightly coordinated Arctic research program.

I would conclude this dissertation of the history of failure on the part of the executive agencies to arrive at an Arctic science policy administratively with the most recent example. The interagency Arctic group (IAGP), the latest interagency group to be assembled to handle this problem administratively, drafted an Arctic study report which could have been the foundation of a comprehensive Arctic policy.

In January 1982, the Department of the Interior, 1 of 10 Federal agencies represented on the IAPG, successfully stifled the final issuance of the IAPG report and undercut the attempts to create an Arctic policy administratively. I hope my colleagues will keep that fact in mind as the Department of the Interior presents its testimony this morning.

Earlier this spring, Senator Stevens and I traveled to the University of Alaska at Fairbanks to hold a hearing similar to the one we are holding here today. The testimony received at that hearing was nearly unanimous in its support for the thrust of this legislation. Indeed, a panel of some of the Nation's most distinguished Arctic scientists, representatives of Alaska's Arctic residents, and several individuals knowledgeable about the problems associated with resource development in the Arctic, enthusiastically supported this bill and offered some constructive suggestions as to how the bill could be improved. Many of those suggestions were adopted and are embodied in Senate amendment 1443, an amendment in the nature of a substitute to S. 1562.

Finally, Mr. Chairman, I would like to conclude my statement this morning with an observation about my understanding of the manner in which the Office of Management and Budget has handled their assessment of the bill. On September 1, 1981—over 10 months ago—OMB was invited to provide executive comment to the Committee on Governmental Affairs. No such comment has arrived. Instead, OMB has adopted a behind the scenes approach that I find extremely objectionable, which I share with my colleagues.

A number of executive agencies with a stake in Arctic research were invited here to testify on this bill. A number of them including—the State Department, the National Science Foundation, and the National Atmospheric and Oceanic Administration to name a few—understood the importance of this legislation and were prepared to come to the Hill and support it on the public record. As recently as late yesterday afternoon, the last of these agencies—the State Department—was informed by OMB that they could only testify in opposition to the bill.

Obviously this is wrong, Mr. Chairman. The Coast Guard has informed us that they could only come to answer technical and nonpolicy questions related to Arctic research. We will, however, be hearing from two Federal Departments this morning, Mr. Chairman. While I have not had an opportunity to study their testimony I can surmize by their very presence that they probably oppose the bill.

Senator STEVENS. Let me interrupt you. We will not hear from any Federal agency this morning. I am not going to take the direction of OMB on a hearing that we conduct on a bill of this importance to our State and I will just tell you now that we are not going to have any testimony here from people that have had their hands tied behind their backs or their previously proposed testimony censored. We will hear the other witnesses.

Senator Jackson and Senator Murkowski and I will meet with Mr. Stockman. If that doesn't do, we will meet with the President. We will not hear from any of the executive agencies.

Senator MURKOWSKI. Thank you, Mr. Chairman.

I do wish to thank and commend Senator Roth, the distinguished chairman of the Governmental Affairs Committee, for scheduling these hearings and I also want to thank you and Senator Jackson for all your assistance and guidance in developing this very important issue. I think you would agree with me, Senator Stevens, that the major reason that we do not have an Arctic policy in this country today is the realization that all the Arctic in the United States happens to be located in the single State of Alaska. That concludes my remarks.

Senator STEVENS. Thank you very much, Senator. I appreciate your statement and that of Senator Jackson.

Our first witness today is Hon. Terry Miller, Lieutenant Governor of the State of Alaska.

TESTIMONY OF TERRY MILLER, LIEUTENANT GOVERNOR, STATE OF ALASKA, ACCOMPANIED BY JIM SOUBY, DIRECTOR, DIVISION POLICY DEVELOPMENT AND PLANNING, OFFICE OF THE GOVERNOR

Mr. MILLER. Thank you, Mr. Chairman.

I would like to introduce Mr. Jim Souby, director of the division policy development and planning within the Office of the Governor. He will be complementing my testimony.

Senator STEVENS. Good morning.

Mr. MILLER. Mr. Chairman, I appear before you today to present the views of the State of Alaska on Senate bill 1562, or alternatively, amendment 1453, the Arctic Research and Policy Act, introduced by Senator Murkowski and cosponsored by Senators Stevens and Jackson.

I want to take this opportunity to commend Senator Murkowski, and you, Mr. Chairman, as well as the distinguished Senator from Washington for your foresight in the introduction of this legislation. In its broad conceptualization, this measure addresses an issue of long standing. On behalf of the State of Alaska I would like to offer a few suggestions regarding the implementation provisions of the bill in just a moment.

First, let me say that the need for a strong U.S. Arctic research policy has long been recognized. In addition, coordination of research programs in Alaska and other areas of U.S. Arctic interest is essential. A carefully articulated policy framework is imperative if both national and State objectives for natural resource development, national defense, environmental protection, and enhancement of human health and social conditions are to be met.

In my view, this legislation is required to mobilize the bureaucracy, the science community and Alaska. Administrative efforts have not yielded the results we need.

Second, there was never a more critical time for the development of the policy framework envisioned in this legislation.

We are facing critical national problems which can, in part, be solved by development of our Arctic resources.

Increasingly, the world's populations will need the resource riches of the Arctic. The Arctic holds such a varied treasure of natural resources and splendor as to defy the imagination.

Future generations will need the Arctic, but the Arctic's future—and its beauty—can only be safely secured with care.

A national Arctic science policy can become the tool by which careful and correct decisions can be made about the Arctic.

More needs to be understood about its unique environment, its relationship to the rest of the globe, and how technologies can be adapted to meet the challenges of the North.

For example:

We are all aware of the Nation's dependence on foreign oil, natural gas, and strategic minerals. Few of us, however, are aware that our own scientists are forced to borrow time on Soviet vessels to conduct marine research essential to the prudent development of these resources.

We all have memories of severe storms that have caused untold damage and loss of life. Few of us, however, realize how much Arctic conditions influence the weather across the United States.

We all tremble at the thought of nuclear missiles coming in over the Arctic. Few of us, however, understand that our detection capabilities can be severely impaired by magnetic disturbances that are common in the North.

Resources that many of us take for granted are products of the Arctic:

Millions of our waterfowl breed in Alaskan wetlands.

Five percent of the world's fish catch comes from our Bering Sea. This represents but a fraction of the total catch available there.

This productive bounty can be a two-edged sword. Alaska is at once the primary beneficiary and object of coming Arctic development.

More than Americans living anywhere else, Alaskans will be directly affected by the successes and mistakes made in the approaching decades. The Arctic developments we foresee as essential to meet our national needs have to be compatible.

We cannot forsake our fisheries for our oil.

More important, we cannot forsake our citizens who depend on a fragile Arctic environment for their livelihood.

As you can see, much knowledge is needed if we are to assure that Alaska's human and natural resource endowment is to achieve its full potential.

Let me cite just four examples of the kinds of research I am talking about today.

First, though great strides in Arctic research have been made in the past 15 years, we still lack the scientific background and engineering capability to achieve national benefits from Alaska's Arctic coal and strategic minerals. The development of offshore oil and gas resources in ice-stressed seas faces similar constraints.

Second, we still do not know enough about the populations and behavior of the bowhead whale or caribou. The perpetuation of these populations is critical to the physical and cultural well-being of dependent Native peoples.

Third, we do not understand the potential impacts of offshore oil and gas development upon our vast fisheries resources. Our fisheries must form one of the mainstays of our economy after our oil is depleted.

Fourth, we even lack an economically feasible technology for reliable water and waste disposal systems for citizens of our rural communities, many of whom remain among the most disadvantaged citizens of this Nation.

For these reasons alone, the State of Alaska is prepared to work in a full partnership with the Federal Government to assure the proper resource development which this national Arctic research and science policy can realize.

Mr. Chairman, in my extended written testimony, I have provided some historical perspective and additional details regarding the State's view on the legislation before this committee today.

With the permission of the chairman, I would like to ask that the full text of my prepared statement be included in the hearing record.

Senator STEVENS. It will be.

Mr. MILLER. Thank you, Mr. Chairman.

Mr. Chairman, to offer some specific comments on the institutional arrangements for the implementation of an Arctic research policy as set forth in the measure, I would like at this time to request Mr. Souby to read into the record our recommendations.

Senator STEVENS. Thank you very much. Mr. Souby.

Mr. SOUBY. Mr. Chairman, the State of Alaska has four areas of concern with the institutional provisions of the bill before this committee. These are presented in considerable detail in the State's extended testimony.

We have had an opportunity to review amendment 1453. Essentially in the view of Alaska these would in fact codify the full partnership spoken to.

Rather than go through them in the detail that is contained in the State's remarks, I would like to briefly run through them here.

Our first concern is with the ex officio status of the State's seat on the Arctic Science Policy Council. We would recommend that in lieu of Alaska's ex official seat, an additional Presidential appointment be made from a list of nominees provided by the Governor. That would preserve the national interest because of the three national representatives, but it would also insure that the States make commitments as they recognize the determination to prioritize policies and so on.

The second recommendation we would make is that on the Arctic Science Commission Alaska should be recognized in the determination of priorities. As you will recall, the bill provides that the Commission prepare the priorities and then submit them to the Council for review and approval. We feel it would be appropriate and efficient to have the Council and the Commission consult with the State of Alaska. We also feel that if two of the four expert scientists on the Commission were from Alaska, one from the university, and one from the State, that that would enhance those activities. We would also like to see two residents named for those positions that call for individuals who have knowledge of residency in Alaska. Although the bill doesn't mention residency as a requirement, people who could give the most, contribute the most to the duties of the Commission would be residents.

We would also like to see the duties of the Council amended slightly to spell out in greater detail the expectations for the Council itself and the nature of its relationship with the State of Alaska.

With respect to the duties of the Arctic Research Commission, we have two recommendations: First, specifically identify the University of Alaska as one of the universities that the Commission would consult with. This is because the university itself has a tremendous stake in arctic research, a tremendous research budget, and a tremendous amount of information, knowledge, and expertise to contribute to the efforts of the Commission. The second recommendation concerns the location of the Arctic data center. It should be one of the duties of the Commission to locate that data center within Alaska.

As you are fully aware, we have several existing facilities that deal with Arctic information at the present time. They are somewhat disparate, but we think that those facilities could be centralized and could provide us a valuable function at the least expense and greatest value to the research going on in the Arctic.

As you are probably aware, 100 universities in addition to the State and Federal governments conduct research in Alaska and we think the information data center should be in close proximity to that work. Those are the recommendations that the State has for the bill and we would be happy to work with the committee to discuss them further.

Senator **Stevens**. Thank you very much.

We have not been able to discuss it with you yet, but in view of the action taken by the Office of Management and Budget, I think we may be compelled to review once again the financing of this Commission and the studies and research that it undertakes. I would request that you review the same concept. The concept we are reviewing is the same one that was developed in the Federal-State planning days. We have had joint commissions in which the State matched the Federal level of expenditures, and State appointed its own people and the Federal Government appointed its people under a joint chairmanship. They worked together and established priorities and shared the workload.

We have not worked out the details on that yet. I have suggested it to Senator Murkowski. We will discuss it later. I won't ask you to comment on it now because I think in fairness that you and the Governor must have an opportunity to explore that idea in depth, including its ramifications as far as future funding levels that may be imposed on the State.

I do think that there is a feeling that we are a rich State and that we ought to be more out front in funding.

As a practical matter, under the procedure that is outlined in Senator Murkowski's bill, ultimately the State may bear more than half the share.

I think Alaska may have to offer to match the Federal Government dollar for dollar, and see how that works. I don't ask you for a comment today but ask you to study that.

Senator Murkowski.

Senator **Murkowski**. Thank you, Mr. Chairman.

We seem to be in a peculiar situation with OMB dictating apparent objections to this bill without recognizing a couple of facts that we are all aware of. One is that most public land is, of course, in Alaska. About 80 percent is owned by the Federal Government.

As a consequence of that, and the fact that they object to the creation of an arctic science policy, I assume their objection is based on what they see as an outgoing of Federal funds for a purpose that is questionable in their own minds. Since the record will be open for a period, I believe, of 2 weeks, Mr. Chairman, it may be possible for the State to provide their estimate of the cost savings to be realized potentially at least, or address the bill from the standpoint of the Federal Government as a primary beneficiary of Arctic research. The Federal Government benefits from the land mass and the associated potential development not only of oil and gas but other resources from public lands in Alaska. A general review, of the State's opinion that it would be a very good investment for the Federal Government to participate in funding along the lines suggested in the bill would be helpful. The Federal Government would get a large return on its own investment and a decrease in the redundancy that is all too apparent.

It is unfortunate that OMB did not see fit to participate in this hearing and make its objections known because I think they could have learned a great deal about what the potential return is.

I respectfully ask that the State consider submitting its opinion on what the return might be to the Federal Government.

Mr. MILLER. Mr. Chairman, I would be delighted to do that. I might add in response to both your comments that it is our estimate that the State expend in the neighborhood of $34 million each year in research.

The majority of that is dedicated to Arctic research which is a substantial sum of money. I am sure Dr. Roederer will be testifying for the University of Alaska. Dr. Roederer is identified with an internationally known institute and may have some insights as well. As we found out a couple of Congresses ago, the American people have a vital stake in Alaska, as represented by the national interest lands legislation. That decision was made in part to preserve much of that.

I think the American people have exactly the interests in Alaska that as you have indicated: They will have 63 percent ownership of our State in addition to its global position; some of the resources and the magnificent bounty of the Outer Continental Shelf. To a lesser extent there is a national interest in the weather patterns, wildlife migration and the like.

As this country, and other countries, look north to the future for resources, we are going to have to increasingly rely upon the Arctic and it must be done right. The only way it can be done right is to develop the knowledge and the technology. That can only happen with research.

It is my judgment, Mr. Chairman, coming back to your question, that within our own internal budget process, which is not quite as extensive as your own, but still is formidable, that the legislature would appropriate such funds as they could. The money would have to be identified and cataloged to show the U.S. Government what we do, to assist in that effort. Because we are simultaneously the beneficiaries and the object of that increasing development.

I think we will be more than willing to play a partnership role, but just as with the national interest lands legislation, the American people and the Congress must recognize that there is a national interest in the development and it ought to be done correctly.

It seems to me this is an eminently reasonable approach to that development. That is why the State so enthusiastically supports this legislation. It is long in coming and much overdue.

Senator **Stevens**. I agree. As chairman of the Defense Appropriations Subcommittee, I am sure we are all aware of the vast depth of defense interest of our potential adversaries in Alaska and in the Arctic.

The Soviets have fought three wars in the Arctic. We have never fought one. They concentrate most of their training in the Arctic. We periodically take some of our units to the Arctic. I think, as Senator Jackson mentioned, that the security interests in the Arctic are overwhelming. OMB's indication that it is going to negate this attempt to coordinate Arctic science policy which would have a significant impact on the DOD's policies and activities in the Arctic is really myopic considering the future of the Arctic and its importance to the world.

I appreciate your taking the time to join us and testify. I want you to know that we will look forward to working with you as we try to get this bill enacted.

Mr. **Miller**. Mr. Chairman, we will try to accommodate Senator Murkowski's request for that additional information.

Senator **Stevens**. Thank you very much.

[Mr. Miller's prepared statement follows:]

STATEMENT OF

HONORABLE TERRY MILLER
LIEUTENANT GOVERNOR OF ALASKA

BEFORE THE
COMMITTEE ON GOVERNMENTAL AFFAIRS
OF THE
UNITED STATES SENATE
S. 1562, THE ARCTIC RESEARCH AND POLICY ACT OF 1982

Mr. Chairman, I am Terry Miller, Lieutenant Governor of the State of Alaska. I appear before you today to present the views of the State of Alaska on S. 1562, the Arctic Research and Policy Act, introduced by Senator Murkowski and cosponsored by Senators Stevens and Jackson.

I want to take this opportunity to commend Sen. Murkowski, and you, Mr. Chairman, as well as the distinguished Senator from Washington, for your foresight in the introduction of this legislation. In its broad conceptualization, this measure addresses an issue of long-standing. On behalf of the State of Alaska I would like to offer a few suggestions regarding the implementation provisions of the bill in just a moment.

NEEDED: A NATIONAL ARCTIC SCIENCE POLICY

First, let me say that the need for a strong United States Arctic science policy, as well as coordination of research programs in Alaska and other areas of U. S. Arctic interest, has long been recognized. A carefully articulated policy framework is imperative if both national and State of Alaska objectives respecting natural resource development, national defense, environmental protection, and enhancement of human health and social conditions are to be met.

PREVIOUS POLICY EFFORTS

This legislation represents the culmination of efforts begun some years ago. Well before the Prudhoe Bay oil discovery brought a great surge of development to Arctic Alaska, there were attempts made by Alaska's first senior senator, the late Bob Bartlett, to establish a strong U. S. policy commitment to Arctic science and to achieve directed and coordinated research programs. With encouragement from Senator Bartlett and Senator Henry Jackson, Joseph H. Fitzgerald, the first chairman of the Federal Field Committee for Development Planning in Alaska, prepared an Arctic policy statement for presidential action.. After three years Fitzgerald succeeded in getting the statement put before the President of the United States in 1968. It remained unsigned, however, as Lyndon Johnson left office. About the same time , former Governor of Alaska, Walter Hickel brought attention to U. S. Arctic affairs during the Republican National Convention of 1968, and later, as Secretary of the Interior, focused a major conference on the subject.

HISTORICAL PERSPECTIVE

After a lapse of over a decade, I am most pleased to see revitalized attention to Arctic science being shown in the Congress through the introduction of S. 1562. It is needed now more than ever before. Let me illustrate just how imperative this initiative is with some historic perspective.

Since statehood for Alaska was achieved, the Congress has dealt with a succession of legislation designed to further the economic condition of our State. The Alaska Statehood Act itself formed the foundation. Congress came to our aid in assuring recovery from the disastrous earthquake of 1964, and the Fairbanks flood of 1967. You have aided Alaska through legislation in shared revenues and in the sale of the old military communications system to the private sector.

Both justice and social and economic development for Alaska's Native citizens were fostered by passage of the Alaska Native Claims Settlement Act of 1971. Finally, the long and controversial debate over the national interest lands in Alaska was resolved by the passage of the Alaska National Interest Lands Conservation Act of 1980.

These actions, in conjunction with judicious development of the State of Alaska's own natural resource potentials, form the framework within which Alaska and its people can construct a better future. Measures to assure better State/federal cooperative land and resource management are in place. Some of Alaska's finest wilderness and scenic "crown jewels" are preserved for future generations. The long-awaited conveyance of land to the State and to the Native peoples is proceeding. Moreover, Alaska is now in the proud position -- for the first time since Statehood -- of providing more to the wealth of the Nation than it receives annually from the federal government.

Yet, Mr. Chairman, all is not well. Despite Alaska's image as a northern oil sheikdom our wealth is not nearly as great as believed. The cost of doing virtually anything is much greater in Alaska than in the contiguous 48 states. Distances are vast, our population dispersed. Alaskans are discriminated against by the tax laws which take a higher proportion of our earnings, without regard to the higher cost of living in Alaska. Our projected oil revenues are declining, resulting in stringent spending limitations. Yet, these very revenues must pay for the great developmental expenditures we must incur in order to provide economic alternatives for the day when Alaska's oil, such an important contribution to this Nation's economy, will inevitably be gone.

EXAMPLES OF NEEDED RESEARCH IN ARCTIC

Much knowledge is needed if we are to assure that Alaska's human and natural resource endowment is to achieve its full potential. For example:

- Though great strides in Arctic research have been made in the past fifteen years in certain key disciplines, we still lack the scientific background and engineering capability to achieve national benefits from Alaskan coal and strategic mineral development. The development of offshore oil and gas resources in ice-stressed seas faces similar constraints.
- We still do not know enough about the population dynamics and behavior of the bowhead whale or caribou, the perpetuation of which are critical to the physical and cultural well-being of dependent Native peoples.
- We lack knowledge of the potential impacts of offshore oil and gas developments upon our vast fisheries resources, which must form one of the mainstays of our economy after our oil is depleted.
- We even lack an economically feasible technology for provision of reliable and sanitary water and waste disposal systems to citizens of our rural communities, many of whom remain among the most disadvantaged citizens of this Nation.

So, Mr. Chairman, we have a blue print to construct a viable and enhanced northern society -- put toegether in large part by the Congress -- but we still lack the engineering and scientific research structure to make it a reality.

STATE OF ALASKA COMMENTS ON S. 1562, AS AMENDED

It is in this context that I would like now to comment upon the institutional arrangements for Arctic research implementation set forth in S. 1562.

1. Enhanced Role for State of Alaska

The recent amendment (# 1453) put forward by Senators Murkowski, Stevens and Jackson, specifically Sections 3, 4, 6 and 7 which establish and set the duties of an Arctic Science Policy Council and an Arctic Research Commission, represents refinements in the bill subsequent to recent hearings in Fairbanks. However, the State of Alaska remains concerned that representation of its views at the Council level remains solely via an ex-officio seat on the Council. Certainly, the State does not desire to preempt federal prerogatives and responsibilities regarding Arctic research, particularly federally sponsored research in Arctic areas outside of Alaska and its adjacent seas. However, the U. S. Arctic and Alaska are virtually synonymous. It seems only reasonable therefore that Alaska's voice should be more strongly heard.

Accordingly, in lieu of the present ex-officio seat, I recommend that an additional Presidential appointment be made from a list of nominees to be provided by the Governor. This appointee should have full powers on the Council. IN this way, Alaska's concerns will be addressed while maintaining the national character of the Council. Suggested language to reflect this enhanced role for the State is attached at Appendix A.

II. Alaska a Full Partner

As a general rule, this legislation should recognize Alaska as a full partner in the development of Arctic science policy and research priorities. It would be entirely appropriate to require the Arctic Science Policy Council to consult with State entities prior to setting or revising research policy and priorities.

Section 4 regarding the duties of the Council, therefore, requires strengthening where Federal/State cooperation is called for. Accordingly, I recommend adoption of the specific wording changes attached as Appendix B.

The Arctic Research Commission established pursuant to Section 6 will, of course, be vital in affecting the policy directions established by the Arctic Science Policy Council. In choosing members for the Arctic Research Commission, I believe it is very important to remember and stress the role of Alaska's science community. More research projects in Alaska are conducted by State of Alaska agencies or by the University of Alaska than by any other sector of the research community. Federal agencies in Alaska are next in total project numbers.* Also, a substantial majority of all researchers are resident Alaskans.* These crucial facts must be reflected in the make-up of the Commission if it is to be truly effective in fostering more, and better coordinated, research in our Arctic.

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* Analysis of the Current Research Profile 1979. Underwood, Larry S., Ph.D., University of Alaska, AEIDC; Anchorage 1981.

I therefore commend to your attention our Appendix C containing specific changes to Section 6(b)(1) regarding Commission membership.

III. Duties of the Commission

With respect to the duties of the Commission set forth in Section 7, I have two concerns. First, the intent of Subsection (a) paragraph (1), which deals with Commission recommendations to the Council on research priorities, should be clarified and strengthened. Our specific recommendation can be found in Appendix D.

Second, paragraph (2) of Subsection (a) is of great importance and interest to the State of Alaska. I fully support the concept of a data collection and retrieval center, but with two caveats:

> (1) The first is that such a center should be located -- NOT in a suburb of Washington, D. C., -- but in Alaska, where the vast bulk of research efforts will be conducted, and the majority of the affected scientific and policy communities are located.
>
> (2) The establishment of such a center should not result in a "reinvention of the wheel". Full cognizance should be taken of existing institutions in Alaska which might perform this valuable function. Necessary language changes to address these points is contained in Appendix D.

IV. Definition of "Arctic"

The legislation should also establish an appropriate definition for the Arctic in Alaska. As no one geographical construct is entirely satisfactory, the definition should reflect practical concerns and provide for easily identifiable boundaries. In its initial form, the legislation identified the Arctic as the North Slope and adjacent seas. As with the North Slope and its offshore seas, there is promise of great mineral wealth from the Bering Sea and its adjacent onshore areas. These areas, too, are on the frontiers of engineering and environmental knowledge. They also support far greater biotic resources with concomitantly greater human populations dependent upon them for commercial and direct subsistence purposes.

The Bering Sea fisheries resources are enormous. The 1980 optimum yield for the major species was over one and three quarter million metric tons, or 3 billion, 850 million pounds. Moreover, many of the physical environmental phenomena encountered in these areas are essentially the same or intimately linked with those on, and adjacent to, the North Slope Hence, I strongly support the amended Section 11 proposed by Senator Stevens, which defines the Arctic in Alaska as those lands North and West of the Porcupine, Yukon and Kuskokwim Rivers (known as the P-Y-K line). This would include the coastal zone of Bristol Bay, the Aleutian Islands, the North Slope and adjacent Bering, Chukchi and Beaufort Seas.

Mr. Chairman, with the adoption of these suggested amendments, I believe will at last be able to establish institutional mechanisms to carry forward vitally needed Arctic research. With this Committee's assistance, our national Arctic research initiatives will come not just from the federal sector, but in partnership with the State of Alaska and with the private sector and academic community.

In summation, Mr. Chairman, let me reiterate the conceptual support of the State of Alaska for this legislation. I urge its passage, as appropriately amended. With its enactment, we can initiate the best possible program of Arctic scientific endeavor that we as a nation can undertake. The stakes are high in economic and social terms, not only for Alaskans but for all peoples of our nation. The effort envisaged by the sponsors of this legislation will help us regain our stature among our circumpolar neighbors. Most important, it will assure that this great land -- our last frontier -- is treated with the foresight and respect its richness and beauty so rightly deserve.

Again, I thank the Chairman for his courtesies today and am prepared to respond to whatever questions the Committee may have at this time.

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APPENDICES: PROPOSED CHANGES TO S. 1562

APPENDIX A: Section 3, Subsections (b) through (e)
APPENDIX B: Section 4, Subsection (a), paragraphs (1) and (4)
APPENDIX C: Section 6, Subsection (b), paragraph (1)
APPENDIX D: Section 7, Subsection (a), paragraphs (1) and (2)

APPENDIX A:

Section 3, Subsections (b) through (e)

(b) The Council shall be composed of the following members appointed by the President:

(1) Three members from among individuals knowledgeable in the field of Arctic science who have been nominated for membership on the Council by the Secretary of Defense, the Secretary of the Interior, the Secretary of Transportation, the Secretary of State, the Secretary of Commerce, and the Director of the National Science Foundation.

(2) One member from among individuals knowledgeable in the field of Arctic science who have been nominated for membership on the Council by the Governor of Alaska.

(c) Each member shall have an equal vote on matters decided by the Council.

(d) (1) The President shall designate a member of the Council as Chairperson of the Council.

(2) The Chairperson shall exercise a tie-breaking vote when necessary.

(e) (1) Except as provided in paragraph (a), the term of office for a member of the Council shall be three years.

(2) Of the members of the council first appointed under paragraph (1) of subsection (b)

(A) one shall be appointed for a term of one year;

(B) one shall be appointed for a term of two years; and

(C) one shall be appointed for a term of three years.

(3) A member may serve after expiration of his/her term of office until the President appoints a successor.

APPENDIX B:

Section 4, Subsection (2), paragraphs (1) and (4)

(a) The Council shall:

(1) maintain a cooperative working relationship with the Office of the Governor of the State of Alaska, and with the Alaska Council on Science and Technolgoy with respect to

(A) promulgation of Arctic science policy;

(B) establishment of research priorities;

(C) cooperative planning, funding and logistical support of research; and

(D) storage, transfer and dissemination of Arctic scientific and technological knowledge and data.

. . . .

(4) after consultation with the Governor of the State of Alaska, appoint the members of the Arctic Research Commission.

Section 4, Subsection (a), paragraph (5)

(a) The Council shall:

. . . .

(5) maintain a cooperative working relationship with the Office of the Governor of Alaska, and with the Alaska Council on Science and Technology with respect to

(A) promulgation of Arctic science policy;

(B) establishment of research priorities;

(C) cooperative planning, funding and logistical support of research; and

(D) storage, transfer and dissemination of Arctic scientific and technological knowledge and data.

APPENDIX C:

Section 6, Subsection (b), paragraph (1)

(b)(1) The Commission shall be appointed by the Arctic Science Policy Council and shall be composed of the following members:

(A) Four members shall be appointed from among individuals with expertise in representative areas of research related to the Arctic (including the physical, biological, and social sciences), one of whom shall be professionally associated with the State of Alaska, and one of whom shall be professionally associated with the University of Alaska.

(B) Two members shall be appointed from among individuals directly familiar with the Arctic, and directly familiar with, and representative of the needs and interests of Arctic residents.

APPENDIX D:

Section 7, Subsection (2), Paragraphs (1) and (2)

(1) Survey Arctic research conducted by Federal and State agencies, the University of Alaska and other universities, and other private and public institutions to determine priorities for future Arctic research and make recommendations thereon to the Council and other interested parties.

(2) Establish a data collection, storage and retrieval center for Arctic scientific and technological knowledge and data which shall:

(A) have its principal offices located in Alaska; and

(B) make use of existing institutions and facilities.

Senator **Stevens**. Again, I mean no offense to those who are here to testify for their agencies for the Federal Government. But I do not intend to hear just one side of the issue as far as the Federal Government is concerned. That does not mean that some of those who would testify would be necessarily opposing the legislation.

We have had significant cooperation from the agencies involved as we have prepared for this hearing. But I think we are entitled to a definitive decision by either Mr. Stockman or by the President, if necessary, as to the role that the Federal Government is going to pursue as we are trying to work out a partnership between the Federal Government and the State of Alaska in this area and, therefore, I do not intend to call for testimony from any of those who represent Federal agencies today.

The next witness will be Dr. Juan Roederer, director, Geophysical Institute, University of Alaska.

TESTIMONY OF JUAN G. ROEDERER, DIRECTOR, GEOPHYSICAL INSTITUTE, UNIVERSITY OF ALASKA

Mr. **Roederer**. Good morning, Mr. Chairman. I appreciate the opportunity of being able to testify here.

My name is Juan G. Roederer. I am director of the Geophysical Institute of the University of Alaska. Today my testimony is personal, although I believe that much of what I will say is shared by my colleagues within and outside Alaska, who are engaged in basic and applied scientific research on Arctic problems. I speak here as a producer of Arctic science, as a person responsible to the taxpayers of the country for the delivery of a product that is difficult to measure in dollars; knowledge.

Knowledge, which in this case of Arctic matters, transcends far and fast the boundaries of pure science to form the basis for a technology on which the future of the entire Nation depends. I emphasize, Mr. Chairman: the Nation, not just Alaska.

Let us not forget that it is estimated that at least half of the Nation's petroleum reserves lie in the U.S. Arctic; that it is estimated that at least half of the Nation's coal reserves lie in Arctic or sub-Arctic territory; that almost the entire North Amerian defense perimeter lies in the Arctic; that a vast richness of food awaits to be extracted systematically by our fisheries industry form our Arctic waters; that minerals yet to be appraised are suspected in these areas, on land and on the ocean floor; and that physical processes occur in the Arctic that have crucial effects on the rest of the globe, such as the interaction between polar climate and sea ice, or the effects of space perturbations on the upper atmosphere and the ensuing interferences with electromagnetic communications and surveillance systems.

The scientific knowledge required for all this is not only the basis on which pertinent technologies are to be built. It also provides the basis on which the protection of the environment and the people will rest.

The acquisition of scientific knowledge on the Arctic in the Arctic poses some very special problems. One is that the scientific questions per se are often very special, requiring scientific specialization and experience that take years to gain. Another is the requirement of complex, unusual and very costly logistic support. A third is that physical and biological phenomena in the Arctic have a tendency of crossing disciplinary boundaries in some way due to the strong interactions and delicate equilibria, both physical and ecological, that we find in polar regions.

The result of all this is that polar science is eminently interdisciplinary in nature, that polar phenomena and processes cannot be studied in isolation, that these studies are very expensive, that they have to compete with more traditional science endeavors at lower latitude, and that they often fall between the cracks of agencies and peoples' frames of mind.

Mr. Chairman, it has only been during the last 5 years that I have been directly involved in Arctic research. But it took much less than that to realize that Arctic research is not being conducted in the most cost-effective manner. Nor is it being conducted at a level commensurate with its potential impact on the economic future of the country. Mr. Chairman, I might be accused of exhibiting what some media and some politicians call the "typical arrogance of scientists," but I believe that it is the scientists in the field who actually produce the scientific knowledge in question, who are the ones that collectively must judge whether or not what they do is done cost effectively. Only those who ultimately plan and execute research can do that.

I have yet to find a scientist, I mean an active scientist, whether he or she works in one of the U.S. projects in Svalbard, or participates in the new multimillion dollar radar project in Greenland, or conducts oceanographic research in the eastern Arctic Ocean, or works in polar atmospheric circulation or studies ionospheric electric currents with the U.S. observatory network that extends through northern Canada, or, for that matter, simply works in Alaska, who does not agree that there is a need for better coordination, more efficient information exchange, a more adequate and stable funding base earmarked to relieve the pressures of increased logistic demands and cost-of-living, and a need for more training programs throughout American universities targeted on Arctio research.

To satisfy these needs a policy-guided national Arctic research program is necessary. There are many critical problems in the Arctic for which tighter coordination is warranted, and there are many issues in the Arctic for which an acceleration in collection of scientific information and knowledge will improve the quality of decisionmaking.

There is ample documentation, especially in recent years, of such needs. There is no need for me to give examples here. The creation of a policy directive to initiate and broadly guide the implementation of a national Arctic research program is amply justified, and in my opinion bill 1562, as amended after the hearings in Fairbanks represents a major step toward achieving that goal.

In the past, there have been several high level attempts to coordinate Arctic research programs. For instance, in 1967 the Interagency Arctic Research Coordinating Committee (IARCC) was established and given a number of excellent-sounding tasks. In 1971 the National Security Council issued Decision Memorandum No.

144 requiring the development of a coordinated plan for scientific research in the Arctic, and assigned the task to IARCC.

In 1978, under the assumption that the need for interagency coordination in Arctic research was sufficiently understood, the President's Science Advisor informed the pertinent agencies of the formal dissolution of IARCC. In May 1982 a study conducted by the Departments of Interior, Defense and Energy states that ". . . the intentions of Decision Memorandum No. 144 have never been implemented and the U.S. lacks an explicit Arctic research policy."

It is sad for me as a scientist and a taxpayer to read the documented history of government attempts to coordinate Arctic research how interagency disputes over areas of responsibility have frustrated the implementation of an Arctic Science Policy.

Strangely enough, or perhaps not so strangely, we have a clear-cut and effectively implemented Antarctic research policy. Yet we have no indigenous people there, there is no resource development yet, and military activities and territorial claims are suspended as long as the Antarctic Treaty is in force.

A complicating factor in the Arctic, that also makes it so distinct from the Antarctic, is the existence of vast applied research needs of industry that must be satisfied swiftly as they emerge. I am firmly convinced that industry would greatly benefit from an expanded public data base on the Arctic environment and Arctic processes and that they would benefit greatly from a better and faster conduit to the sources of scientific information other than their own.

I do not share the fears that a national Arctic science policy would lead to increased industry regulations. In my opinion, Mr. Chairman, it is ignorance and uncertainty that breed overregulation.

Another complicating factor is the fact that Alaska is the only State in Arctic and subarctic territory. An Arctic research policy is thus viewed by many as a research policy for Alaska, as a bonanza for Alaskan scientists.

Mr. Chairman, the resource development in the U.S. Arctic and subarctic regions and adjacent waters and the deployment of defense systems at high latitude have become a vital part of our entire Nation's economy, trade, and security. Health and quality of life are important factors as the related human activities expand to the high north, enter a demanding unfamiliar environment, and encounter Native populations whose traditions have been honed by centuries of life under adverse conditions. The development of a cost-effective Arctic technology that benefits the entire country and that is both compatible with a reasonable policy of environmental protection and beneficial to the local populations, is a challenge that demands a massive underlying research effort in basic and applied science—a research effort that only can be conducted in the unique environment whose bounty and perils are to be unraveled, assessed, and understood.

In summary, a national Arctic research policy will not only benefit the Alaskans. I find it a paramount example of a policy that would address simultaneously all four national goals, as expressed by the President: More vigorous economic growth, enhanced national security, stronger competitive position in world markets, and better health and quality of life for all our people.

And now, Mr. Chairman, allow me to comment on a few points regarding the bill before us.

In section 7 on the Duties of the Arctic Research Commission, I respectfully suggest that one of the main tasks of the Commission be to identify gaps in Arctic research, to set priorities to fill these gaps of knowledge, and to make grants and contracts to carry out the necessary research. The Commission should not appear as setting priorities for all Arctic research, thus intruding into the specific and normal activities of other Federal agencies.

It must be assured that Arctic research carried out by Federal, State, and private organizations continue and, if possible, be strengthened independently of the activities and the specific mission of the Arctic Research Commission. In its interaction with those other organizations, the Commission should play a role of communicator and stimulator of research, funding only that research which is designed to fill critical gaps, or those activities designed to bind together existing research projects on a sound logistics base.

Finally, I respectfully suggest that to defuse further criticism of the bill from certain sectors, any direct reference to the Naval Arctic Research Laboratory be dropped but that instead, the proposed Commission be mandated to conduct a broad study of the needs for logistic bases and field laboratories in the Arctic, which then of course would include consideration of the future of NARL.

Mr. Chairman, I strongly support Senate bill 1562; I am firmly convinced that most of the scientists active in Arctic research also do.

Thank you.

Senator **Stevens**. You have visited the Soviet Union on scientific matters. Can you tell us how their scientific research base compares to ours as far as the Arctic is concerned?

Mr. **Roederer**. Mr. Chairman, I often hear statements, particularly recently, that say: "Enough research is being done in the Arctic." My answer is yes, but only if you throw in what the Soviet Union is doing. I am extremely impressed with the massive efforts that are going on in that country and I have personally visited many crucial Arctic research organizations in Siberia, and in the northern parts such as Murmansk, Apatity, and so on.

The Soviet Union has four interrelated goals toward which their Arctic science policy is oriented. First, integration of the Arctic and the 4 million people that live in the Soviet Arctic. Second, the development of Arctic oil and gas fields onshore and offshore and of the mining industry in the Arctic. Third, the integration of marine and land transportation systems, which is almost already achieved. Fourth, the consolidation of their northern defense systems, and research activities in relation to defense systems testing, et cetera.

It is estimated that there are something like 20,000 to 25,000 scientists working in the Soviet Union on Arctic science. One has to be very careful in considering this figure. I think that the Soviet scientists are about one-tenth as efficient as U.S. scientists, especially in terms of infrastructural support, computers, and electronic equipment that they have. But it is still a considerable number, considerably larger than the European and U.S. scientists involved.

The Soviets are conducting a massive effort, but it is not very well coordinated. In fact they have problems similar to ours. Agencies, in their case branches of the Academy and ministries, quibble over turf. However, all in all, it is a massive effort that involves many institutions: the Arctic and Antarctic Institute in Leningrad; the Hydrometeorological Service headquartered in Moscow; the various research rocket ranges run by the Hydromet Service and the Academy institutes, the Institute of Physics of the Earth that have several observatories and laboratories in the north; and the Academy branches, particularly at Apatity, Iskutsk, and Yakutsk, that run laboratories all along the northern tier of the Soviet Union.

If you will permit me, Mr. Chairman, to read just two or three quotes from a very recent article that you also mentioned earlier in the Journal of Commerce of June 11, reporting recent developments in Soviet policy and planning in Arctic research. It is said here:

> Soviet experts believe that about 70 percent of the country's continental shelf is promising from the viewpoint of the search for oil and natural gas. No less than 170 Soviet scientific institutes are now involved in research linked to offshore oil and gas deposits.

Of course again we have to apply a correction factor. Industry and government go together there. So this is equivalent to our effort throwing in our industry research to be fair in that comparison.

Reading on from that Journal:

> Many thousands of offshore oil workers must be trained, the Soviet spokesman said. This requires institutes, specialized technology schools, a system of special vocational schools, new teaching staff, and new textbooks.

Senator **Stevens**. Where is their continental shelf? Isn't it opposed to ours? Basically, the Russian continental shelf is just opposite Alaska's.

Mr. **Roederer**. That's true. It goes from Chukotka up to the west along their coast. If I may quote the Soviet spokesman again:

> As to the Arctic, the USSR will need to solve its own problems because the experts of the world do not yet have sufficient experience in Arctic conditions. They do not seem to have high regard of what other countries are doing in the Arctic!

Senator **Stevens**. It's obvious that they are doing a great deal more than we are, even with their lack of distinction between industry and government.

Senator **Murkowski**. Doctor, would you draw a comparison between what is presently occurring in the United States Arctic, vis-a-vis Canada? Do we have any research vessels specifically dedicated to Arctic research? We have research vessels dedicated to research that are used in the Arctic waters from time to time. But I don't think one can say that the research vessels that we have are enough. I am referring specifically to a recent development in Canada where a petroleum company announced construction of a prototype tanker with new icebreaking techniques. I wonder if you could comment. What are we doing?

Mr. **Roederer**. Perhaps I am not the right person with full knowledge to answer in detail. We are not embarked on any major program of developing ice-strengthened vessels.

Senator **Murkowski**. Let me ask one more question, Mr. Chairman.

You indicated that you felt perhaps there was some misconception connected with this Arctic research bill in the sense that Alaska and Alaskan scientists would benefit rather than the entire country. I think the chairman would agree with me that this is something we come up against time and time again. These are misconceptions of Alaska and Alaska's generation of revenues. I am concerned that this attitude is prevailing in the scientific community as well. Do you think that's the case in the scientific community?

Mr. **Roederer**. No, Mr. Chairman. From my perspective, which covers geophysics and space sciences, certainly that is not the case. We do get comments, though, but in a friendly fashion, when we submit a proposal on the basis of competitive bidding. Our proposals are reviewed, for instance, proposals submitted to NSF, by a number of peer reviewers. We sometimes hear: "Hey, you are very expensive up there! So it is from that point of view that we feel some incidence. But it is a very important incidence in the sense that, for instance, in a proposal on the same kind of research done in Antarctica, the logistics costs do not have to be built into the proposal. For the same kind of work to be performed in the Arctic, we have to build in all logistics costs and therefore, it becomes costly and less competitive.

Senator **Murkowski**. Finally, some of the smaller northern European countries, how do they compare, Denmark, Norway, Sweden?

Mr. **Roederer**. Denmark, until recently, fully owned Greenland, which is a great Arctic landmass. Now, with home rule, things are changing there. Norway, has a great interest in the Arctic and has sovereignty over Svalbard, although any Svalbard Treaty member can conduct research there and even own land. All these countries have one organization, one research institute, with strong interaction with the foreign ministry that handles Arctic science policy, carries out Arctic research, and funds Arctic research. Arctic research in these countries is highly centralized.

Senator **Murkowski**. I have no further questions. Thank you, Doctor.

Senator **Stevens**. Thank you very much, Doctor.

We appreciate your cooperation and positive approach to our legislation.

Roger Herrera, please?

TESTIMONY OF ROGER C. HERRERA, EXPLORATION OPERATIONS MANAGER, SOHIO/ALASKA PETROLEUM CO., ANCHORAGE, ALASKA

Mr. **Herrera**. Thank you, Mr. Chairman.

Senator Murkowski, ladies and gentlemen, my name is Roger Herrera and today I am representing the views of Sohio Petroleum Company, for whom I work as exploration operations manager in Alaska.

I would like, Mr. Chairman, to precis my written testimony which I have submitted to you.

Senator STEVENS. We will print it in full in the record.

Mr. HERRERA. Some of the remarks that I have in my written testimony perhaps became debatable in view of the attitude that we have heard this morning from OMB. However, in general, my purpose in being here is to support the bill. Sohio, because of its importance in the State of Alaska, due to its ownership of oil and gas fields and the fact that it is a vigorous explorer in that State obviously has a considerable interest in Arctic research. Our ability to operate efficiently and safely in that region becomes of paramount importance when we put equipment and people in the offshore arena of the Beaufort Sea, and on the North Slope in the wintertime.

We have spent a great deal of time and effort in pure Arctic research to enable us to go into those regions with reasonable success, coping with the physical conditions and the environment in general. I think the bill that we are discussing today shows a great improvement in its second version, particularly the make up of the Arctic Science Policy Council and the Arctic Research Commission. I think they now have representation which is more in keeping with the designs of the bill than in the first version. If the Commission and Council can be funded in some way the ability of that group of experts to form an Arctic policy on research, and, more importantly, to use their funding to fill the gaps that they identify in Arctic research would be of paramount importance and benefit to the country.

Perhaps because of my operations bias, I would suggest that the work of a Scientific Policy Council of this nature should in fact move us toward practicality in operating in the Arctic. Much of the Nation's Arctic policy would be oriented toward defense, toward operations for oil and gas, toward protecting the environment, and toward the people that live in the Arctic. All of these things are practical things and while I would not disparage in any way the value of pure academic research, I think that new research should have a bias toward operations, then probably in the long term it would be more useful to the Nation.

I have made remarks in my written statement concerning the funding which basically Sohio Petroleum Co. thinks is eminently supportable. I won't repeat those remarks now because obviously if funds from lease sales are not acceptable politically, then other sources presumably have to be found. But I think it is worth mentioning that even if there is minimum funding for the Council and the Commission, the establishment of those groups of experts would be a well worthwhile exercise, even if they do not have the ability to fill up, with their own generated research gaps in the knowledge of the Arctic.

Of particular importance to the oil industry, oil and gas research is a very obvious necessity. Through the medium of the Alaska Oil and Gas Association and through individual companies, a tremendous amount of money is already being spent on research, enabling operations to proceed safely.

This sort of research is not widely circulated, and with your permission, Mr. Chairman, I would like to submit for the record a report which outlines approximately 190 projects which have been funded by the oil industry in Alaska pertinent to the Arctic, which indicates the sort of work that has been ongoing for the past 10 years.[1]

This list of projects is usually private. It rarely sees the light of day. But there is a great deal of data in here. It is the sort of data that the Council and Commission proposed in this bill would have access to, and should have access to, to put into the covenant of Arctic knowledge.

At the moment it does not get into that pool of Arctic knowledge very adequately.

Senator **STEVENS**. We thank you very much for that. That is the kind of thing we want to see shared to the extent that companies are willing to provide it, and put it into a common pool so it can be retrieved by others. I think it would be a terrible waste of funds for industry itself if we found companies being redundant in their scientific research. Certainly we need to have a place where anyone involved in Arctic research can deposit knowledge as a result of research that they have conducted and be certain that it would be available to others on a basis of free access.

Mr. **HERRERA**. Thank you, Mr. Chairman. Over and above the work compiled in that document is, of course, the individual research carried out by individual oil companies. Often this is deemed to be of a competitive nature and once again it rarely sees the light of day. Nevertheless, it is the sort of data which is of general help to the Nation as well as to the individual company and the industry. It is the sort of data which at least in general terms the Commission proposed in this Act should be aware of. For example, my own company, over the past few years, has funded and carried out a great many specific projects.

One of the problems that we see in the Arctic is the ability to access any location, onshore or offshore, at any time of the year, 365 days of the year. Ships, of course, are restricted effectively to the summertime; using over-ice means, one is restricted to perhaps 3 or 4 months in the wintertime. The periods of freezeup and breakup are the times when it is extraordinarily difficult to obtain access, except utilizing helicopters, which are not capable, usually, of lifting anything except personnel. So Sohio has taken upon itself to assemble a group of world experts, to look into, for example, the feasibility of designing a 300-ton self-propelled air cushion vehicle. This would have the capability of accessing Arctic offshore locations at any time and also carrying the major components of, for example, a drilling rig. The benefits of such a vehicle would be obvious not just from the point of view of the oil company and its exploration, but from the viewpoint of oil spill cleanup at any time of the year, and so on. Its benefits would be commensurate with its general capability of carrying large loads.

This is the sort of research which could be carried out quite clearly by the Arctic Research Commission. At the moment it is being undertaken, as I have mentioned, by individual companies.

Senator **STEVENS**. We did have some research in the Arctic with air cushion vehicles that were carried out with funds that I had made available through the Congress for that purpose; to see what could develop. We had hoped that eventually we might have some research to determine whether it would be possible to have what in effect would be air cushion vehicles, to carry material in and carry oil out of the Arctic without the necessity of building trains. If that could be done, I can guarantee you that the country would save a great deal of money. I commend you on that research. We would be happy to see to it that you get the other research that has been done. Again, that is the kind of thing that this Commission ought to have available to make certain that that information which is already produced would be shared by everybody. I think that would be a good thing. I look forward to it.

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[1] See p. 285.

Mr. **Herrera**. Similar studies which SOHIO has carried out in the past few years, Mr. Chairman, have involved other exotic equipment, such as reuseable concrete drilling platforms. This is again an effort to gain access to all areas of the Arctic offshore at any time of the year irrespective of ice or water conditions.

Obviously, we spend a lot of effort in designing reasonable drilling structures for use in deeper water in the Arctic, as have other companies.

Perhaps dominant in our considerations in operating in the Arctic has been knowledge of ice. Although there has been a tremendous amount of research on ice and all its physical parameters, there still remains many unknown factors. The exact capability of ice to destroy a man-made structure in the Arctic is not adequately understood yet. The consequence of this is that inevitably we tend to overdesign the structures. This increases costs and decreases efficiency. So further research into the physical aspects of ice would help industry and the Nation, very considerably.

The dangers of ice, its capability of overriding islands are things which the Eskimos constantly warn us about and which are therefore the subject of ongoing research. We don't have all the answers. We feel we are getting a handle on them, but there is definitely still a gap in the knowledge of what ice can do in the Arctic.

If we understand ice more adequately, we might have the capability of using or creating "ice-movement-free atolls" in the Arctic by artificial means, and thereby utilize very conventional equipment to operate within such atolls. If one can guarantee the ice will not move in a given area, then the ability to operate efficiently increases tremendously.

Many other studies have been carried out, for example, on the caribou. Studies have also been carried out on sea floor soils. Believe it or not, despite the tremendous effort which has been put into permafrost research we can still not adequately identify the top and the bottom of permafrost offshore. This knowledge is of particular importance, and OMB might find this out in the near future if the sales scheduled in the Harrison Bay area take place, because the velocity of sound through permafrost affects the seismic records which oil hunters inevitably use to assess the value of a lease before a sale. If we cannot demarcate the permafrost, we cannot calculate the velocity effects on our seismic records and possibly because of that we will end up with incorrect interpretations, which will result in incorrect bidding.

So this simple physical parameter—where is the permafrost, how deep is it, is one which still puzzles us and one which is still a gap in Arctic research.

Ice movement studies I think I have mentioned. Much of our research has been oriented toward equipment which we use in that environment. The development, design, and construction of Arctic drilling rigs specific for that area has been undertaken as has the design of ice strengthened fuel barges. Sohio undertook the construction of one of these last year and it has been used safely in the Beaufort Sea in the wintertime. Its design was specifically augmented to enable it to be used as a research vessel. Possibly, this coming winter, it will be used in that mode.

Many of these things are necessary purely to establish our competitive position, but many of the research items that we undertake as an individual company are ones which should have been done many years ago, I suspect, in the interest of the Nation.

If the results of that research were available now, I think it would probably increase the bid parameters in lease sales and increase the efficiency of subsequent operations in these sale areas and therefore obviously be to the benefit of the Nation.

In closing, Mr. Chairman, I would like to reiterate what other witnesses have said. The Arctic is unique, a rather unforgiving environment and therefore it is very demanding of a great deal of knowledge, perhaps far more so than in more temperate regions. Therefore, what is proposed in this act will be of specific benefit not just to the scientific community, or the oil industry, but to the Nation in general.

Senator **STEVENS**. Thank you very much. We commend you and your company for taking a positive approach to the problems of the Arctic.

Thank you very much for appearing today.

Senator Murkowski, do you have any questions?

Senator **MURKOWSKI**. Yes. Mr. Herrera, having been in the Arctic as late as last week, it is my understanding that there is a recent realization that within the Prudhoe Bay field there has been known for sometime that at a higher level, there is a heavy concentration of oil that has not been economically viable in the sense of taking it out with the present technical knowledge. The oil is evidently so heavy that you cannot pump it, you cannot inject it and it is something that obviously is a challenge to the industry. But in the development of that oil or the feasibility of the development there are certain other considerations, such as whether in generating steam you can run up against permanent frost. The outfall of that is something that is unknown.

I would assume that these are potential areas where an Arctic research policy would generate a return to the Nation that could theoretically be quite substantial, in the sense that if that oil were recoverable it would not only lengthen the life of the Prudhoe Bay field but make a substantial return to Government as well as to those companies.

I wonder if you could comment on some of the specific areas that you would like to see the Arctic research policy addressing.

Mr. **HERRERA**. Yes. You are quite correct. Above the main producing reservoir in Prudhoe Bay is a reservoir horizon which has *hardly been looked at to date because of the concentration of effort* on the obviously commercial, accessible, deeper reservoir.

It is a small, relatively thin reservoir, about 100 feet thick, which contains heavy oil. Its interest is primarily because it is so widespread. It covers a much larger area than the Prudhoe Bay field itself.

Senator **Murkowski**. So the implication is that it could be a larger field if it could be recoverable?

Mr. **Herrera**. That is certainly correct, although we don't know how much oil is in this heavy oil zone. It is probably significantly larger than the Prudhoe Bay accumulation and, in place, Prudhoe Bay was approximately 27 billion barrels of oil of which approximately 10 billion will be recovered.

If we could recover just 10 percent of that heavy oil it would be a tremendous addition to the Nation's reserves. The research which has been carried out on this particular reservoir to date has been minimal.

The lease holders in the area are now gearing up to initiate research. The questions are: Exactly how much oil is there? How does one make it flow? Is it exploitable? But in general terms, although there is a lot known about heavy oil in Canada, Venezuela, and elsewhere, this is inevitably a unique situation and it does require a specific research.

Yes, this is one area where probably minimum expenditures could result, in a long term, in a fantastic return on the investment.

Senator **Murkowski**. Thank you, Mr. Herrera.

I too commend your company for its very positive attitude on this bill and your testimony today for the record.

Senator **Stevens**. Thank you, very much.

[Mr. Herrera's prepared statement follows:]

TESTIMONY OF ROGER C. HERRERA
ALASKA EXPLORATION OPERATIONS MANAGER
SOHIO ALASKA PETROLEUM COMPANY

before the

COMMITTEE ON GOVERNMENTAL AFFAIRS
UNITED STATES SENATE

on the

ARCTIC RESEARCH BILL (S. 1562)

June 17, 1982

My name is Roger Herrera, and I am the Exploration Operations Manager for Sohio Petroleum Company in Alaska. Today I am representing my company which is the dominant oil producing company in the State of Alaska. Over the past eight years, Sohio has been operator for half the total number of wells drilled in the Alaska Beaufort Sea region. This considerable exploration and production experience has mandated that Sohio become involved in a great deal of original Arctic research, and it is from this background that my comments are generated for today's hearing. In addition to internally generated research, Sohio has also been involved in many of the research projects undertaken by the oil industry to further our understanding of the Arctic environment and increase the safety of operations in that area.

The importance of the Arctic region and Arctic science policy is clearly apparent from the point of view of the ecosystem, the people who live there, and the nation's military defense, but it is equally important because of future hydrocarbon supplies which can reasonably be predicted to be producible from the Alaskan Arctic.

The amended version of Senate Bill 1562, which is the subject of this hearing, is a significant improvement over the initial version. The bill is now more practical and realistic in its methods of overseeing Arctic research, and it rightly establishes the reasons why it is pertinent for the United States of America to have a realistic Arctic policy.

The new version of the bill has been improved in part by the content and balance in the creation of the Arctic Science Policy Council and the Arctic Research Commission. The importance of these two groups is apparent when one examines the number of Arctic specialists in industry, academia and government who are actively carrying out Arctic research and operations at the present time. To be able to establish some coordination and an overall thrust of Arctic research will increase the utility of future work manyfold. The Council and Commission's abilities to fund unique projects will enable them to establish the necessary coordination in realistic terms.

The generation of federal funds for Arctic research proposed in the bill is also worthy of comment. The $25 million dollars annual funding level, or a maximum of $50 million in the research fund at any one time, is not excessive when one considers the operational costs of a polar research ship or the Naval Arctic Research Laboratory (NARL) in Barrow, if that is resurrected as an operational entity. However, whether those amounts of money will be forthcoming on an annual basis from the desired funding source proposed in the bill is a moot question which should be examined fairly carefully. The Arctic Research Fund is unlikely to receive, on an annual basis, the suggested reasonable level of $25 million, from the cash bonus bids and lease rentals received on federal Arctic lands. An annual income from these sources approaching $2.5 billion is extremely remote. This is especially true over the next ten years when no oil or gas royalty income can be expected from the region.

Even if future Arctic OCS areas are perceived by the oil industry to be extraordinarily prospective, it is impossible to expect levels of income measured in billions of dollars when one examines the cost of operating in such areas, the risks involved and the possible scenarios for the future price of oil and gas. While Section 9 (c) authorizes the appropriation of money from the General Fund, it is by no means certain that such monies would be forth coming. It is also unclear how funding generated from lease sales and lease rentals can be directed into the research fund in the fiscal year in which the sales take place. The system seems to require a year's lag in the establishment of the funding level. If a lease sale took place late in a fiscal year, for example, funds would not be available until the next fiscal year. I suspect, furthermore, that the language in this section (Section 9) needs clarification.

The present level of Arctic research, particularly that specific to Alaska, is worth commenting on if only because of its implications for the work of the Arctic Research Commission as proposed in the bill. In 1980 the Arctic Environmental Information and Data Center, which is part of the University of Alaska in Anchorage, assembled the current research profile for research in the physical, biological and related social sciences in Alaska and listed over 1900 projects which were initiated or ongoing in that year. Absent from that listing was 150 projects undertaken privately by individual oil companies or groups of oil companies. The total cost of all that research has not been determined, but it clearly amounted to tens of millions of dollars. 1980 was by no means a unique year, merely indicative of the current Arctic research levels which are ongoing in America. Not all of that research would satisfy the definition of Arctic research as proposed in the bill, but a significant proportion is clearly aimed at the regions of interest as proposed in the bill. It is essential that the ongoing research effort should not be diminished because of the establishment of the Arctic Research Fund, but rather that the fund should be used for new projects which would not otherwise have been attempted from other funding sources.

We would not like to see the Arctic Research Fund displace current funding sources for Arctic research. Rather, if that fund and the managing commission is going to meld Arctic policy, it should be used to bridge gaps in existing research projects and to set up major research facilities, such as a polar research ship or NARL, which would be beyond the economic means of other monetary sources. Furthermore, the fund should concentrate on practical aspects of Arctic operations and science rather than purely academic projects. The justification for such a bias is that the Arctic is likely to become increasingly important militarily, economically and socially as time goes on, and an ability to live, work and function efficiently and safely in that region is of paramount consideration as a national policy objective for the region.

The actions of the oil industry onshore in the North Slope of Alaska and offshore in the Beaufort Sea, with regard to practical operations and research projects, exemplify my point. In the past eight years, thirty wells have been drilled offshore in the Alaska Beaufort Sea. In preparation for that activity, starting in 1970 and continuing up until the present time, the oil industry has funded 184 separate Arctic projects aimed at understanding summer and winter conditions in the Beaufort Sea and developing equipment to cope safely with those conditions. Most of those projects were financed by groups of companies which coordinated their efforts through the Lease Sale Planning and Research Committee (LPRC) of the Alaska Oil and Gas Association. The LPRC Committee today has twenty-three projects under consideration by its member companies and a greater number which are ongoing. Every month that committee receives proposals from organizations, research groups, businesses, and Arctic experts for three to five new research projects. On average, approximately half of those projects are funded by the committee members.

Separate from the research projects of the LPRC committee of AOGA is Arctic work undertaken by an individual company on its own. Much of this work does not get publicized, but it is first class research which results in considerable economic and practical benefits to the company operating in the Arctic environment. Examples of these private research projects are seen in the descriptions of specific studies and engineering efforts which Sohio has embarked upon in the last two years. These have included research into the design and construction of the 300 ton self-propelled air cushion vehicles; field testing of an Archimedes Screw Tractor which has the capability of operating on ice, in water, or on land; the design and testing of reuseable concrete drilling structures for the offshore environment; the engineering and construction of sea-ice roads to offshore drilling locations in the Beaufort Sea; several separate permafrost studies both on and offshore; the refinement of engineering safety factors of gravel island construction; the design and construction of an ice-strengthened fuel barge which was also designed to be used for further offshore research work; the design and construction of state-of-the-art Arctic drilling rigs; the biological and physical monitoring of mud and cuttings disposal in the Arctic environment offshore; the construction and testing of ice override structures, the purpose of which is to prevent an ice-sheet from riding up on natural or artificial islands and damaging equipment on those islands; and an intriguing project which we call the Arctic Dolphin project. This is a simple structure whose purpose is to break up advancing sea ice in deep water causing the ice to pile up on itself, thus building a natural barrier against further ice movements. We hope that the Arctic Dolphin structures, when they are finally proven, will enable us to protect an offshore area in the ice environment from ice movements and thereby carry out activities such as drilling within such an environment, safe from the dangers of ice forces.

We have also undertaken on our own account caribou studies and reindeer studies and an investigation of sea floor soils chacteristics, both in the Beaufort Sea and in parts of the Bering Sea. Sohio instigated and managed a Bowhead whale population survey in the Canadian Beaufort Sea last summer, the results of which will be communicated to the International Whaling Commission this summer; Sohio has just completed an evaluation of the environmental data base in the Bering Sea region and an assessment of the fisheries resources in the eastern Bering Sea; we also recently completed a socio-cultural and socio-economic study of western Alaska pertinent to the region's possibly being impacted by future OCS development.

Additionally, we have funded several ice-movement studies: the design of ice-breakers suitable for operations in the shallow waters of the Beaufort Sea; we have joined in numerous industry studies on ice strengths: on the design of conical structures and their ability to withstand ice loading; on deep water floating steel and concrete structures; on offshore production island design; on the design of an ice reinforced, semi-submersible drilling vessel for the Bering Sea region; on the study of Bering Sea ice conditions; on meteorological conditions in all offshore areas of Alaska; on pipeline laying techniques, both onshore and offshore, and on the siting and construction of pipeline terminals in various parts of Alaska.

All this translates into a tremendous volume of useful, new data and very large economic expenditure, but it illustrates the necessity for ongoing and future research efforts in the Arctic and therefore is indicative of the importance of the proposed Arctic Policy Act.

The work of the Arctic Science Policy Council and the Arctic Research Commission, as proposed in S. 1562, would ensure that the total picture of past and present Arctic research projects is viewed by a group of experts capable of recognizing important research gaps and implementing programs to fill those gaps. The Arctic is a unique environment, and it is only by following a logical, careful policy based on knowledge and experience, that the United States will be able to protect and utilize the vast and precious resources of the region for the benefit of all Americans.

Senator STEVENS. Hans-Pavia Rosing?

TESTIMONY OF HANS-PAVIA ROSING, PRESIDENT, INUIT CIRCUMPOLAR CONFERENCE, NUUK, GREENLAND

Mr. ROSING. Thank you, Mr. Chairman.

Senator STEVENS. Good morning.

Mr. ROSING. Good morning.

My name is Hans-Pavia Rosing. I am president of the Inuit Circumpolar Conference. I come from Greenland. And I am happy to be here today, representing the Inuit of Greenland, Canada, and Alaska.

I wish to begin my testimony today by extending our special thanks to Senator Murkowski for introducing this legislation, and to the committee for holding these hearings today.

The Inuit Circumpolar Conference was organized in Barrow, Alaska in June 1977, and our charter was adopted in Nuuk, Greenland in July 1980.

We organized the Inuit Circumpolar Conference for many cultural, economic, political, and social reasons, but possibly the most important reason for our existence is our need to have a single international Inuit organization capable of dealing with our collective need to negotiate national and international Arctic policy agreements. Therefore it is a happy honor for me to be asked to appear before you today to present the point of view shared by all of the Inuit of North America, the circumpolar view from our common Arctic homeland.

We Inuit of Greenland or Kalaallit, as we call ourselves, share a strong national patriotism with our people in Canada and Alaska. Respect for our homelands is part of our common Inuit heritage, and I must assess amendment No. 1453, National Policy with Respect to the Arctic, in terms of what is good for the Inuit as well as what is good for Greenland. Mr. Chairman, I believe this legislation is good for both.

The coming together of the Inuit from the Bering Sea to the Greenland Sea, and our common quest for coherent Arctic policy began with the first serious Arctic resource development projects in the early 1960's. For the Inuit in northern Quebec, it was hydroelectric development, and Hydro-Quebec's James Bay project. In Alaska, it was the Prudhoe Bay oil strike. This led, as you know, to the enactment of the Alaska Native Claims Settlement Act in 1970 which began a decade of Inuit political growth and development in Alaska, Canada and Greenland. In 1975, Canada joined the Province of Quebec to sign the historic James Bay Agreement settling the claims of the northern Quebec Inuit, and creating the Makivik Corp., somewhat similar to the regional Native corporations established in Alaska earlier.

The rise and growth of the Inuit Land Claims Movement, beginning in Alaska, growing in Canada, and becoming the basis for Greenland's successful home rule movement, which has led to the home rule inauguration in May 1, 1979, is an example of Arctic policy development on the scale we would like to see employed with other common North American Arctic problems.

In 1973, Canadian Inuit joined with the Greenlanders and the northern Scandanavian Saami to plan and conduct the Arctic People's Conference in Copenhagen, and the need for Arctic policy development was discussed. Four years later, the Inuit Circumpolar Conference was organized in Barrow, Alaska. We passed resolution ICC-77-01, which called for Arctic policy development, and in 1980, meeting in Nuuk, Greenland, we passed other Arctic policy resolutions.

I have provided you with copies of resolutions passed by the 1980 Inuit Circumpolar Conference. They fairly well lay out our specific Arctic policy concerns.

I will use this opportunity to emphasize one of our many commonly shared concerns, that of Arctic oil and gas tanker operations. We regard projected Arctic tanker operations as raising serious international Arctic policy questions. Indeed, these questions make Arctic tankering a suitable symbol explaining why our people, and why our nations need to reach Arctic policy agreements.

The Inuit Circumpolar Conference has joined with the Canadian Inuit Community and with Greenland to oppose the Arctic pilot project. Our Arctic pilot project working group has succeeded in focusing the united opposition of all Inuit to Arctic surface tanker operations. We are now in the process of organizing a Beaufort Sea working group.

I would like, with your permission, to refer to the Greenland newsletter which contains transcripts of the testinonies from the Greenland witnesses at the National Energy Board hearings in Canada on the Arctic pilot project.

Now we are in the process of organizing a Beaufort Sea working group.

Another example of ICC efforts to facilitate the development of Arctic policy is our efforts to install a single satellite-relayed communications system to serve all of our Arctic coastal villages in a single network. We will use this network to strengthen our Arctic community, to work toward the achievement of international Inuit goals, to protect our subsistence game habitat and our hunting traditions.

We believe successful Arctic policy can balance the ecological strength of our land with the impact of Arctic natural resource industrial development.

We believe such successful policy will recognize the essential role we Inuit must play in Arctic policy formulation and implementation. The proof of Arctic policy success or failure will be biological. It will be measured in terms of the survival of our caribou, sea mammals, fish and birds, and, consequently, the survival of the Inuit.

And our scientists will take these measurements. If our Inuit communities in the Arctic are to withstand subsistence game habitat destruction through "insignificant" increments, we will need the cooperation of our Arctic scientific community.

Scientific research is our first line of Arctic game habitat defense. If broad national and international Arctic policy development is to occur, Arctic science policy development seems the most likely to lead the way. There has been a long tradition of international Arctic scientific cooperation all across our homeland. And Arctic environmental science seems to be an area in which private industry cooperates well with the academic and public sectors.

So, as you can see, Mr. Chairman, amendnent No. 1453 to S. 1592 is a very important legislative proposal, one of historic importance when viewed from the North. Therefore, I would like to suggest two improvements.

I would include language clearly mandating the development of both domestic and foreign Arctic policy, and mandate the negotiation of an Arctic science policy agreement with Canada, and Denmark aimed at answering questions raised by the Arctic pilot project, and other proposed Arctic oil and gas operations.

I would also like to see you include language acknowledging the essential role we Inuit must play in the negotiation and implementation of Arctic policy. We Inuit are the people of the Arctic-Canadians, Americans, Greenlanders—and we share with our countrymen an Arctic stewardship of national and international importance. This importance should be made explicit in amendment No. 1453 to S. 1562.

This occasion provides me an opportunity to comment upon the work and record of one of the sponsors of S. 1562. Senator Ted Stevens has become an important policy spokesman for his party and his Nation. He has distinguished himself by his demonstrated concern for the Arctic, and his friendship with the Inuit. Therefore, we regard this Arctic policy bill to be a serious legislative proposal with a good chance for enactment.

I would also like to thank Senator Jackson at this time.

The Inuit Circumpolar Conference and our executive council will continue to promote Arctic policy development and agreements, and I hope we can help in the inplementation of S. 1562. Arctic policy development has a high priority with us. The next three quarterly meetings of our executive council will be held in Ottawa, Washington, D.C., and Copenhagen, instead of our own Arctic communities, so we can engage national leaders in Arctic policy discussions.

And our plan is to become a recognized United Nations nongovernmental organization so we can use United Nations diplomatic channels to pursue international Arctic policy agreements.

With your permission, I would like to quote a few words from a report made by a Canadian professor, Mr. Franklin Griffith, who teaches Political Science in the Department of Political Economy, at the University of Toronto and is a member of the National Council of the Canadian Institute of International Affairs.

I think he expresses in one part of this report some concerns that are valid today for us as well. It is the recommendation to respond as appropriate to requests of the Inuit Circumpolar Conference addressed to the governments of Canada, Denmark, the Soviet Union, and the United States and I quote:

> The Inuit have moved more rapidly toward circumpolar cooperation than the governments of the region. The opportunity to coordinate their actions gives them certain advantages, seen most clearly in the added level of difficulty imposed upon the negotiation of transit arrangements for the Arctic Pilot Project. As is shown by social development in Greenland, and to a lesser extent in Canada, it is neither justified nor advisable to slight Inuit interest and requests.

On the contrary, it is appropriate to meet their legitimate needs. This may be done unilaterally in response to Canadian Inuit proposals that have international content—for example, to promote Inuit cultural and social exchanges. The Canadian, Danish, and American governments may however wish to develop a coordinated approach to the Inuit Circumpolar activity.

Finally, I would like to give you the best regards from the premier of the home rule government in Greenland, Mr. Jonathan Motzfeldt and thank you very much for inviting me to speak on behalf of the Inuit Circumpolar Conference.

I will be happy to respond to questions.

Thank you.

Senator **STEVENS**. Thank you for taking time to comment for those of us involved in this legislation. We have watched with great interest the increased strength of the Inuit Circumpolar Conference. I remember well when we had meetings here in the late 1970's concerning the formulation of that. I do congratulate you for what you have done and the Conference is fortunate to have your leadership and, that of others who have been involved.

One of the things we are trying to do in this bill is to involve the people who live in the Arctic as well as those who study the Arctic. I have the definite impression that there is a great deal for many people to learn from those who have discovered through the centuries the ways to survive and to use the Arctic for survival.

One of the things we do contemplate is the definite role in this activity of people from our Arctic.

I assume that you noticed that in the amended legislation. So I thank you for your comments. I don't have any questions concerning what you have been doing.

It would be most hopeful if the other countries involved in the Arctic would see fit to have similar commissions. We ultimately should have an international conference to coordinate international efforts, just as the Arctic Research Commission would have the goal of trying to coordinate U.S. efforts as far as Arctic research and policy are concerned.

Senator Murkowski?

Senator **MURKOWSKI**. Thank you, Senator Stevens. I commend you, Mr. Rosing, on bringing the international aspect into the testimony as far as coordinating Arctic research with other countries affected. Thank you for adding the emphasis that you put on those Inuit people living in the Arctic. We have had testimony concerning the development of the Arctic. I think you provided the necessary balance. I think your suggestion that we involve ourselves in an agreement with Canada, Denmark, and perhaps other countries, certainly has merit.

There has been testimony presented at the other hearings on Arctic research policy, as well as testimony that has occurred in my Committee on Environment and Public Works, in the area of clean air. The international reality of air pollution as it affects the Arctic indicates that we could very well be developing some rather severe problems in association with the slow movement of air masses in the winter. The concentration of industrial pollutants from Northern Europe indicates that we are going to have to have an international approach to resolving these concerns and finding out more about the factual material that is allegedly available to us. We need to know whether it is really occurring and if so, is it occurring in alarming proportions which necessitates an international program.

Mr. Chairman, I very much commend Mr. Rosing's testimony.

We thank you for coming.

Senator **STEVENS**. Thank you very much.

Call on us if we can be of assistance to your organization. We do appreciate your courtesy.

Mr. **ROSING**. Thank you very much.

Senator **STEVENS**. Dr. Davis, Nancy Yaw Davis?

TESTIMONY OF NANCY YAW DAVIS, SITKA, ALASKA

Ms. **DAVIS**. Thank you, Mr. Chairman.

Good morning.

My name is Nancy Yaw Davis. I was born and raised in Sitka, Alaska. After 6 years in college, I returned to the State where I taught anthropology at Alaska Methodist University, Anchorage Community College, and the University of Alaska, Anchorage Senior College. Between 1960 and 1975, I taught over 60 courses, many emphasizing the Arctic and Alaska. I have an M.A. from the University of Chicago and a Ph. D. in anthropology from the University of Washington.

Since 1976, I have been an independent researcher, first as sole proprietor, and, since 1979, as President of a small research company, Cultural Dynamics, Ltd. I have received eight research contracts, all Alaskan related. Two of these were with the Federal-State Land Use Planning Commission for Alaska, and three with the Department of the Interior, Outer Continental Shelf socioeconomic studies program. In addition, I have conducted research in behalf of Native regional corporations and village corporations. My expertise includes knowledge of the anthropological literature throughout the State and field research experience in 7 of 12 Native regions.

I have articles published by the National Academy of Sciences and the Smithonian Institution, and I have been the recipient of a National Science Foundation Grant. In sum, I am an Alaskan; I have been involved in teaching and research in Alaska for 22 years. And I care a great deal about what happens in the Arctic. I come today to speak on behalf of the social sciences and in support of the basic tenets of S. 1562.

To begin, I want to commend the author and sponsors of the bill for including people. The people part of the northern environment is an important concern; it is an absolute requirement to include the people who live in the North, especially those who are indigenous to the area, as was just mentioned by the chairman and Mr. Rosing. They have a special knowledge, expertise, and a vested interest in Arctic science. They must be fully informed of research plans and research results.

We scientists are, after all, visitors and new immigrants. We owe the local residents respect for sharing their special environment, and its resources, with the rest of the Nation. As one of my colleagues wrote to me in preparation for this testimony: "Too often, science and subsequent development in the North has proceeded without reference to the needs of the residents. Many times simple courtesies towards individuals and organizations have been neglected—leaving behind a residue of mistrust." Not to include the people as an integral part of the environment is a serious mistake; to actively involve them as special participants in Arctic policy and research is commendable.

So I compliment you for this.

For the rest of my testimony, I would like to give some examples demonstrating the need for an Arctic science policy, comment on the strengths of the bill as drafted, and make a few suggestions to improve it.

Let me start by giving some examples indicating the need for an Arctic science policy:

First of all, there is an urgent need for coordination of research and distribution of research findings. This need has existed for at least 20 years. For example, in the 1960's the National Science Foundation funded archeological research in southwestern Alaska; I did not hear about it for years afterwards—then at professional meetings outside.

In fact, through the 1960's and 1970's I regularly had to attend national anthropology meetings to find out what was going on in Alaska. Anthropologists, like other scientists, have treated Alaska like a colonial country, flocking north like birds during the summer, and receding south like ice during the winter.

Only years later those of us in Alaska come across a publication or hear indirectly about the research. Rarely during my teaching career did an anthropologist inform me of research activities, even after the research was accomplished. If I was offended, and I was, you can imagine how the Native residents must feel. The examples accumulate over the years.

Let me tell you now of an example that occurred in 1981. At that time my company was under contract with the Department of the Interior, Bureau of Land Management, to provide baseline data on contemporary cultural patterns in northwest Alaska, as part of the OCS oil and gas leasing preparations.

I had noted that the State of Alaska had funded a study of beluga whale harvesting for the NANA region, so I requested my research associate in Anchorage to inquire about the study's progress and whether or not research was planned for a particular location and village. My associate inquired and was given no information from either of the investigators concerning their plans, the location or timing of their research.

On my advice, he proceeded to make the contacts through the Native corporation and the village council to visit the area.

We wanted to gather information concerning contemporary beluga hunting and distribution practices. Much to his chagrin, after all these efforts, he discovered when he arrived at the village that a study on the very topics he was asking about had just been finished. The State-funded researcher had left less than 48 hours before my associate arrived.

In the absence of a clearing house of information about who is doing what and where they are doing it, unnecessary duplication occurred. It wasted funds, as well. Finally, it caused us all embarrassment. The villagers thought my researcher was part of the earlier effort, sent in to doublecheck the information, as if we did not trust the Native people to give the right information the first time. "Aren't you partners with those other guys?", the residents asked, rightfully puzzled. This is just a small example which has been occurring—unjustifiably occurring—over a long period of time.

I recognize that a certain amount of overlap and duplication can be productive; a dose of competition can spur thought processes; uncertainty can be conducive to creative ideas—but too much is destructive, counterproductive, and debilitating to good science.

What Arctic science policy, and its associated Council and Commission, must do is encourage a creative milieu for a wholesome, supportive exchange of ideas. By funneling information and broadening perspectives, intellectual resources and funds can be directed into a productive continuity so that all branches of science will thrive. To do this, there must be a reliable format for the flow of information into the Council and the Commission; there must be a physical location with the technology and organization capable of managing the data. More importantly, there must be a format for the flow of information outward from the center to the Native and other residents and organizations in the Arctic, to international centers of science, and to all participants in northern research and science.

The importance of data management, the accessibility and dissemination of information, and the coordination of research cannot be emphasized enough. If, for example, it is required to run a proposal through the Commission so there could be a check for possible duplication, this very requirement might serve to cut back on the repetitive work and the recycling of outdated information.

Dr. William Schneider, an anthropologist with the oral history project at the University of Alaska in Fairbanks, sent me the following comments on this topic for inclusion in this testimony:

> I am encouraged by Section 7(a)(2) which emphasizes the need to establish a data collection and retrieval center but I think that existing libraries, museums, and information centers need to be supported; let's not reinvent the excellent collections; we need to build upon them. This means money for collection, development, curation, and dissemination.
>
> One of the first tasks of the Commission should be to assess existing facilities, their needs and ways to strengthen their effectiveness. Many people simply do not realize that these facilities are very labor-intensive—buying more books or acquiring collections does not make them available. There must be trained professionals to process information, catalogue, index, disseminate information and establish retrieval systems for effectively compiling information on existing topics. There are some activities already under way which need to be adequately supported, encouraged and strengthened.
>
> One of the most exciting areas is the role that computer retrieval programs are beginning to play in helping us to assemble data. Yet these programs depend upon trained professionals with sufficient resources and time to assemble organized search capabilities. Here again, coordination, avoidance of duplication, and sufficient resources and time to address particular issues are high priorities.

With the kind of a coordinated science policy envisioned in S. 1562, and the kinds of mechanisms included in the bill, I believe the Commission could serve—among other things—as information broker.

It could be capable of understanding the different scientific efforts and could translate research findings and send them outward, across social groups, cultures and across disciplines, not just within a particular area of interest or only upward into the levels of bureaucracy.

As I see it, the Council and Commission, in implementing a coordinated Arctic science policy could become a model for the accomplishment of an interdisciplinary scientific effort. The United States could lead in the integration of scientific disciplines and findings, especially as they apply to a highly integrated environmental system.

The Arctic is such a system—involving the land, the rivers, the ocean, but above all involving people. And it is people, after all, who are the ultimate recipients and benefactors of good science and the wiser decisions that can be made with excellent information. And it is also people who can hurt the most; and are most vulnerable to bad science, to inappropriate decisions. It is not just the northern people who might suffer; in the long run the Nation is potentially affected.

And may I say again that to be successful any Arctic science policy must become increasingly people-oriented. For example, we know little about the traditional ways of human adaptation in the North; we know even less about the new emerging adaptations that are taking place today. We know more about the resilience of Native cultures during famine, than we know about what is happening to them now with relative affluence.

It is these human issues, the people part of the environment which must be addressed first, not last. These considerations need also to include new arrivals to the North, the new permanent residents, the transient workers, and the scientists themselves who contribute to the changing population.

Let me speak now as an Alaskan about the composition of the Council and Commission. The Council appears heavy with Federal appointees. I guess I was a little concerned, as the Governor's representative was earlier that Alaska needs a full person on the Council. However, the proposition of the composition of the Commission recognizes each of the major contributors to Arctic science and does allow for local input. Also the timing of the appointments guarantees continuity; science should not have to hibernate before elections.

Section 5a(2), which mandates the agencies cooperate with the Council, is likely to generate some resentment. I had no idea what was going to happen this morning, but I guess this is a part where social science can contribute, as I had a sense when I read that section that there might be some resentment. So I will go ahead and include this paragraph.

Many agencies are already laden with new responsibilities resulting from ANILCA and they are not likely to be amenable to yet more requirements. However, it is becoming increasingly clear that something must be done to clarify and sharpen the areas of responsibility, especially in response to these new requirements of ANILCA.

The land management boundaries are drawn, but fish, wildlife, and people tend to be highly mobile. So are the scientists. Even though boundaries are fixed, life will continue to flow over and far past them. The Council and the Commission will have to work hard at the start to establish procedures to insure that the agencies will cooperate with each other, but I should hope that those steps be taken in the positive spirit to achieve what is intended, that is a wholesome, creative support system for excellence of scientific research in the North.

In closing, I want to thank the committee, especially the chairman, for the invitation to testify today and for the chance to express the viewpoint of one Alaskan social scientist researcher.

Senator STEVENS. Thank you, very much, Dr. Davis.

Do you think that this lack of coordination of scientific research in Alaska in the past hurt the credibility of the research and the data that has been gathered by it? Has it been harmful not to have the coordination in the past?

Ms. DAVIS. I think it is bad, yes, because it raises questions about what has been done. There is duplication and recycling. You see materials that are produced years ago that seem to be current and they are not.

The lack of knowing what one agency is doing, trying to find out who is doing what and how it might overlap is very frustrating. I think it is unnecessary. It is inexcusable in this day and age.

Senator STEVENS. What do you do now? You are involved in it now. What do you have to do to find out if someone has already done what you have been asked to do? How would you go about today coordinating without such a Commission?

How can you find out what the Federal, State, or local people, have done?

Ms. DAVIS. I have no efficient way to do this. It is very costly to run a computer check on it. For one thing, there hasn't been that much contemporary cultural anthropology accomplished. But the most efficient thing to do is to call a former student of mine in Anchorage and ask Judy what is happening in, say, the northwest part of Alaska in terms of anthropology or in terms of social science generally and she will have it at the top of her head.

Senator STEVENS. Are you talking about my sister-in-law?

Ms. DAVIS. I called on her, too. [Laughter.]

Does she work there?

Senator STEVENS. Yes.

Ms. DAVIS. OK. But I recently found out that there is a computerized system being worked on at the University of Alaska in Fairbanks. That is another place I can check. It has got some subsistence studies. But you have to have key people to touch base with, to know what they are doing, how they are funded, what the material is, so that they can translate my questions into the machine. They have to know what to ask and translate it back to me in terms of its appropriateness to the task that I have been asked to do.

That takes highly skilled knowledgeable people. It would help if we all knew what was happening. There is a form that we go through. I personally prepare a statement saying who I am, what I am doing, the name of the research, how well it is funded, and so forth. Then there's a statement, one paragraph of what I am doing and when it is due. So that when I go to the communities, I stop in Juneau, to see if there are offices that should know and be interested in what I am doing. I give them a copy and hope they will take greater interest in what I finally produce. Hopefully, it will go out.

Right now I am very frustrated. I think the materials I have worked on in the last 5 years are sitting in a stack of 70 different documents. They all look alike. I don't know whether there is any distribution from the OCS Office to these other places.

I would like other divisions within the Department of Interior to have that material. Also, the university should have that material.

There are about five major parallel sets of research going on. One is industry which has been mentioned and is supportive of the kind of coordination we need in science.

Another one is the university and their contacts. They know, for example, who from the University of Wisconsin is coming north in summer. If you know which universities are doing what then you can touch base with them later in the professional meetings. That is another way to find out.

Then you have the agencies. You may have as many as four different agencies interested in one kind of research. There were 25 different studies on moose and about four different Federal agencies and two State agencies involved in moose. Of course, moose do move around; maybe different populations but sometimes I get a little furious that the moose get so well funded. There was $30,000 for the social cultural aspects of the people in that area. That turns out to be about 3 cents a person. But in any case, we do need to look at these different parallel costs.

Senator STEVENS. Nobody is shooting people, Nancy. [Laughter.]

Ms. DAVIS. Actually people get a lot more attention if they are dead and they are called cultural resources than if they are alive and living in the area.

So if you are in the cemetary, you will get more attention, because they were funded $225,000 last year, for example.

But you do have parallel systems of research going on with very little communication. I could spend a great deal of my time trying to find out who is doing what. It is easier to find out after it is done. I think we will have more and more overlap, people stumbling over each other on the ice unless we get some sort of coordination.

I had no idea until recently that the Corps of Engineers were involved in the area. There is much that I learned about Arctic research in preparing for this testimony. There is a tremendous anount of interest people have there.

I think we really must look closely at the people of the Arctic. There are many layers, many levels of people in the Arctic. There are people who were there before, people that are coming back that had left for awhile, that are indigenous to the area. They can revitalize interest in the area. Then you have the people that have come up, decided to stay. So when we as scientists come in, we have an intense milieu already there. We must be sensitized to that and work creatively within it.

I think as scientists come and go, we should realize that we come from a peculiar culture with what are sometimes peculiar questions and interests.

We need the support and participation of the people who live in the Arctic. Those of you who are in the Arctic, you know how keen those minds are, how perceptive they are. I think as scientists we must involve them very meaningfully, might from the beginnings, the Council, the Commission, any research being suggested.

Right now the most research going on is through the North Slope but yet every one of those studies is people related. You look at all the other studies. There is no mention of people.

The Antarctic studies are funded because there are no people down there. It is much easier to go south with your research if you don't have people to cope with—not just people of other cultures and residents, but the permanent residents who are in a way making a human adaptation.

I am delighted you used that term in the bill, human adaptation and social sciences. That is a piece of history as far as the bill goes.

Senator **Stevens**. Thank you.

Senator **Murkowski**. Thank you.

I think you have put a perspective on the bill that is most important and you have put it together with the concern of the people involved in the area. You have been a couple of years in State government as well as the senior Senator from Alaska, and we can appreciate the realities associated with experts who seem to have come to Alaska and either write a book or make a study and release it when they go home or something happens to it. The value that is associated with that is often lost, sometimes for good reason and sometimes it is too bad, it is lost. It should be coordinated.

I think your testimony has been most helpful. I commend you.

Senator, I would like to take this opportunity to thank you and members of your staff, particularly Tonja Musko, who I think has done an outstanding job in this preparation of material.

I certainly agree with the action that you have taken as chairman of this committee in limiting the testimony today to those agencies who are among the free thinkers in our group, if I may say so.

I think your action was most appropriate. I would also like to thank Dave Garman of my staff.

Senator **Stevens**. We will schedule another hearing after we have our meetings with the OMB and if necessary, the White House.

I think that they must get the message that this is something that is very vital to the future of not only our State, but in my opinion, of our country's contribution to Arctic research.

We will stand adjourned in recess. The record will be kept open for 2 weeks and we will announce the date for the next hearing.

Thank you, very much.

[Whereupon at 12:07 p.m., the committee recessed, to reconvene at the call of the Chair.]

ADDITIONAL MATERIAL SUBMITTED FOR THE RECORD

Calendar No. 931

97TH CONGRESS
2D SESSION

S. 1562

To provide comprehensive national policy dealing with national needs and objectives in the Arctic.

IN THE SENATE OF THE UNITED STATES

JULY 31 (legislative day, JULY 8), 1981

Mr. MURKOWSKI (for himself, Mr. STEVENS, Mr. JACKSON and Mr. GORTON) introduced the following bill; which was read twice and referred to the Committee on Governmental Affairs

SEPTEMBER 30 (legislative day, SEPTEMBER 8), 1982

Reported by Mr. ROTH with an amendment in the nature of a substitute

[Strike out all after the enacting clause and insert the part printed in italic]

A BILL

To provide comprehensive national policy dealing with national needs and objectives in the Arctic.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, ~~That this Act may be cited as the "Arctic Research and Policy Act of 1981".~~

99-127 O—82——13

~~FINDINGS AND PURPOSE~~

~~SEC. 2. (a) The Congress finds that—~~

~~(1) the Alaskan Arctic, onshore and offshore, contains vital energy resources which can reduce our dependence on foreign oil and improve our trade balance;~~

~~(2) the Arctic represents our only common border with the Soviet Union and is critical to our national defense;~~

~~(3) the Alaskan Arctic provides essential habitat for marine mammals, migratory waterfowl, and other forms of wildlife which are important to the Nation and which are essential to the subsistence culture of Alaska Natives;~~

~~(4) the pace and scale of developmental activities and resource development projects in the Arctic—the United States, Canada, and the Soviet Union—is accelerating in response to the resource needs of the Arctic-rim nations;~~

~~(5) resource development projects that are either currently underway in or proposed for the Alaskan Arctic include—~~

~~(A) offshore petroleum development in the Beaufort Sea;~~

~~(B) the Alaska natural gas transportation system;~~

~~(C) a proposed natural gas liquids pipeline;~~

~~(D) scheduled lease sales onshore in the National Petroleum Reserve—Alaska;~~

~~(E) exploration of the Arctic National Wildlife Range;~~

~~(F) development of icebreaking tankers to move oil from offshore areas to the United States;~~

~~(G) other Arctic-rim countries and Japan; and~~

~~(H) proposed development of Arctic coal reserves;~~

~~(6) Arctic research to date has been fragmented and has been accorded far too low a priority, whether measured in terms of energy resources, wildlife habitat, or national security;~~

~~(7) there is a need to better organize the Federal effort in Arctic research and coordinate this effort with ongoing State programs, university projects, and efforts by private industry and indigenous Native communities; and~~

~~(8) a coordinated Arctic research policy is critical to our national defense, to the timely development of essential natural resources in the Arctic, and to the responsible management of fish and wildlife resources.~~

~~(b) It is the purpose of this Act to recognize the importance of the Arctic to our national security and to our economic well-being, and to ensure that needless delay, unnecessary conflict, and significant economic losses that could result from the absence of an adequate Arctic research program do not occur. Therefore, the objectives of this Act are to—~~

~~(1) direct the administration of a coordinated Arctic research policy in which important basic and applied research issues will be addressed in a timely fashion;~~

~~(2) provide an information system through which the results of nonproprietary Arctic research carried out by Federal and State governments, universities, and the private sector are made accessible to the public in order to prevent inadvertent duplication of research;~~

~~(3) make the results of such research available to private industry, State governments, and local communities that are also conducting research on or are impacted by Arctic development;~~

~~(4) foster international cooperation among Arctic-rim nations, where appropriate, in the development and exchange of scientific information and technology;~~

~~(5) accelerate, where appropriate, the pace of basic and applied Arctic research so that needed re-~~

~~source development can take place on a timely basis and in accordance with national needs;~~

~~(6) establish the means for providing the financial support necessary to conduct needed applied and basic research; and~~

~~(7) establish an institutional framework to assure the achievement of these objectives.~~

~~ARCTIC RESEARCH COUNCIL~~

~~SEC. 3. (a) There is established the Arctic Research Council (hereinafter referred to as the "Council") which shall be composed of the Secretary of the Interior, who shall serve as the Chairman of the Council, the Secretary of Defense, and the Secretary of Commerce. The Governor of the State of Alaska may serve as an ex officio member of the Council. The Administrator of the National Oceanic and Atmospheric Administration, the Director of the Smithsonian Institution, and the Director of the National Science Foundation may attend meetings of the Council as observers.~~

~~(b) The Chairman of the Council shall request the heads of other Federal agencies to participate with the Council when matters affecting their responsibilities are considered by the Council.~~

~~DUTIES OF COUNCIL~~

~~SEC. 4. The Council shall coordinate a comprehensive Arctic research policy. To carry out this function, the Council shall—~~

~~(1) establish a clearinghouse for all Arctic research that has been conducted by the Federal Government. Each executive department or agency of the Federal Government shall provide annually to the Council copies of all studies or reports completed by that department or agency, or on its behalf, related to research on the Arctic. The Council shall compile a comprehensive list and index to all such studies and reports, and shall, to the extent permitted by Federal law, make the studies and reports, as well as the index thereto, available to the public;~~

~~(2) request each executive department or agency of the Federal Government to keep the Council currently informed of all ongoing studies, reports, or research projects undertaken by that department or agency, or on its behalf, concerning Arctic research;~~

~~(3) establish, on an annual basis, after soliciting the views of affected Federal agencies, the State of Alaska, the Native community and private industry, priorities for research activities based on national needs and ongoing activities;~~

~~(4) direct each executive department or agency of the Federal Government to prepare a report, within six months of the date of enactment of this Act, which contains—~~

~~(A) a list of all responsibilities or activities of the respective department or agency that may impact the Arctic environment or the residents of the North Slope of Alaska; and~~

~~(B) a description of the steps, including research, that the department or agency has taken or is planning to take to ensure that its activities or the activities of others for which it is responsible are undertaken in a manner that minimizes, to the maximum extent practicable, any adverse impacts on the Arctic environment and residents;~~

~~(5) determine, upon the completion of the study mandated in section 1007 of the Alaska National Interest Lands Conservation Act (16 U.S.C. 3147), whether the Naval Arctic Research Laboratory should be maintained to house and coordinate substantive research projects or for such other purposes as the Council deems appropriate. If the Council determines that the Naval Arctic Research Laboratory should be maintained, the Council—~~

~~(A) may delegate to or contract with any Federal department or agency, the State of Alaska, the North Slope Borough, or the State of Alaska university system to administer the activities of the Naval Arctic Research Laboratory; and~~

~~(B) shall permit any Federal department or agency, the State of Alaska, the North Slope Borough, public and private schools and universities, and the private sector to utilize the facilities of the Laboratory, provided that each user of the facilities shall pay to the Council all costs reasonably associated with its use of those facilities;~~

~~(6) manage the Arctic Research Fund established pursuant to section 6 of this Act;~~

~~(7) coordinate, after consultation with the Secretary of State and in conjunction with his offices, exchanges of information about the Arctic on an international basis; and~~

~~(8) report to Congress annually on the activities pursued by the Council.~~

~~ADVISORY COMMITTEE~~

~~SEC. 5. The Chairman of the Council shall establish an advisory committee comprised of—~~

~~(1) scientists with credentials in Arctic research;~~

~~(2) representatives of private enterprise active in the Arctic; and~~

~~(3) representatives of Native residents of the North Slope of Alaska;~~

~~whose views shall be sought and considered in the establishment of priorities for Arctic research activities.~~

~~ARCTIC RESEARCH FUND~~

~~SEC. 6. (a)(1) There is established an Arctic Research Fund into which there shall be paid 1 per centum of all revenues received by the Federal Government from disposition by sale or lease of any interest in the Outer Continental Shelf located off the coast of the North Slope of Alaska and in lands on the North Slope of Alaska. The Arctic Research Fund shall support the activities of the Arctic Research Council and, if the Council determines that the Naval Arctic Research Laboratory should be maintained, the operating and maintenance costs of and the research activities conducted at the Naval Arctic Research Laboratory.~~

~~(2) No more than $25,000,000 shall be paid into the Arctic Research Fund in any one year and the total amount of money in the fund at any one time shall not exceed $50,000,000.~~

~~(b)(1) With regard to those Arctic research projects identified by an executive department or agency pursuant to section 4(2) of this Act and the responsibilities identified by~~

~~an executive department or agency pursuant to section 4(4) of this Act, the respective executive department or agency shall maintain the responsibility to fund the projects it has so identified.~~

~~(2) If an executive department or agency administers a permitting program for exploration or development activities or transportation of energy resources, that department or agency shall, where authorized by other Federal law, require the applicant to conduct or fund specific Arctic research as is necessary to assure that the activity is accomplished in a manner designed to minimize its impact on the Arctic environment and the Native people of the North Slope of Alaska.~~

~~(c) Pending the accrual of funds in the Arctic Research Fund to a level sufficient to support the Arctic research mission established by this Act and the operating and maintenance costs at the Naval Arctic Research Laboratory, the Secretary of Defense shall provide the funding necessary to maintain the Naval Arctic Research Laboratory, unless the Council determines pursuant to section 4(5) of this Act that the Laboratory should no longer be maintained. Such funds shall be forthcoming from the various services based in Alaska and such other discretionary funds that the Secretary of Defense has available without regard to restrictions in previous authorization or appropriations Acts.~~

~~DEFINITION; NONAPPLICABILITY OF THE NATIONAL ENVIRONMENTAL POLICY ACT~~

~~SEC. 7. (a) For purposes of this Act, "North Slope of Alaska" means all United States territory, offshore and onshore, north of 68 degrees north latitude.~~

~~(b) The National Environmental Policy Act of 1969 (83 Stat. 852) shall not be construed, in whole or in part, as requiring the preparation or submission of an environmental impact statement by the Arctic Research Council or the Secretary of Defense for any activities conducted pursuant to the provisions of this Act.~~

That this Act may be cited as the "Arctic Research and Policy Act of 1982".

FINDINGS AND PURPOSE

SEC. 2. (a) The Congress finds and declares that—

(1) the Arctic, onshore and offshore, contains vital energy resources that can reduce our dependence on foreign oil and improve the national balance of payments;

(2) as our only common border with the Soviet Union, the Arctic is critical to national defense;

(3) the renewable resources of the Arctic, specifically fish and other seafood, represent one of the Nation's greatest commercial assets;

(4) Arctic conditions directly affect global weather patterns and must be understood in order to promote better agricultural management throughout the United States;

(5) industrial pollution not originating in the Arctic region collects in the polar air mass, has the potential to disrupt global weather patterns, and must be controlled through international cooperation and consultation;

(6) the Arctic is the only natural laboratory for research into human adaptation, physical and psychological, to climates of extreme cold and isolation and may provide information crucial for future defense needs;

(7) atmospheric conditions peculiar to the Arctic provide a unique testing ground for research into high-latitude communications, which is likely to be crucial for future defense needs;

(8) Arctic marine technology is critical to cost-effective recovery and transportation of energy resources and to the national defense;

(9) most Arctic-rim countries, particularly the Soviet Union, possess Arctic technologies far more advanced than those currently available in the United States;

(10) Federal Arctic research is fragmented, uncoordinated and undercapitalized at the present time;

(11) such fragmentation has led to the neglect of certain areas of research and to unnecessary duplication of effort in other areas of research;

(12) there is an immediate need to formulate a comprehensive national policy to organize and fund currently neglected scientific research with respect to the Arctic;

(13) the Federal Government, in cooperation with State governments, should focus its efforts on the collection and characterization of basic data related to biological and geophysical phenomena in the Arctic, directing special attention to the broad accumulation of data related to sea-ice dynamics; and

(14) research into the long-range environmental and social effects of development in the Arctic is necessary to mitigate the adverse consequences of such development to the land and its residents.

(b) The purposes of this Act are—

(1) to establish an Arctic Science Policy Council and an Arctic Research Commission to promote Arctic research;

(2) to establish a centralized system for the collection and retrieval of scientific data with respect to the Arctic; and

(3) to establish priorities and provide financial support for basic and applied scientific research with respect to the Arctic that is currently being neglected and is essential to our Nation's needs.

ARCTIC SCIENCE POLICY COUNCIL

SEC. 3. (a) There is established a council to be known as the Arctic Science Policy Council (hereafter in this Act referred to as the "Council").

(b) The Council shall be composed of the following members:

(1) A chairperson appointed by the President, with the advice and consent of the Senate.

(2) Two individuals from the State of Alaska who have demonstrated a knowledge and interest in the field of Arctic Research, appointed by the President from a list of individuals submitted by the Governor of the State of Alaska. The President in his or her discretion may request additional names to be submitted.

(3) Two individuals who have demonstrated a knowledge and interest in the field of Arctic Research, appointed by the President from lists submitted by the Secretary of Commerce, the Secretary of Defense, the

Secretary of the Interior, the Secretary of the Department of Energy, the Secretary of State, the Secretary of Transportation (on behalf of the Coast Guard) and the Director of the National Science Foundation. The President in his or her discretion may request additional names to be submitted.

(c) Each member shall have an equal vote on matters decided by the Council.

(d)(1) Except as provided in paragraph 2, the term of office for a member of the Council shall be two years.

(2)(A) Of the members of the Council originally appointed under paragraphs (2) and (3) of subsection (b), one member appointed under paragraph (2) of such subsection, and one member appointed under paragraph (3) of such subsection shall be appointed for a term of one year.

(B) A member may serve after the expiration of his term of office until the President appoints a successor.

(e)(1) A member of the Council not otherwise employed by the United States shall be compensated at a rate equal to the daily equivalent of the rate for level V of the Executive Schedule under section 5316 of title 5, United States Code, for each day such member is engaged in the actual performance of his duties as a member of the Council.

(2) A member of the Council who is an officer or employee of the United States or of the State of Alaska shall serve without additional compensation.

(3) All members of the Council shall be reimbursed for travel (in accordance with 5 U.S.C. 5701) and other necessary expenses incurred by them in the performance of their duties as members of the Council.

(4) No member may be compensated for more than ninety days of service each year in performance of his or her duties as a member of the Council.

DUTIES OF COUNCIL

SEC. 4. (a) The Council shall—

(1) facilitate cooperation between the Federal Government and State governments with respect to Arctic research;

(2) coordinate and promote cooperative Arctic scientific research programs with other nations (in consultation with the Secretary of State);

(3) develop and supervise an integrated national Arctic science policy (except with respect to the areas of authority specifically reserved to the Arctic Research Commission under section 7 of this Act);

(4) appoint the members of the Arctic Research Commission; and

(5) cooperate with the Governor of the State of Alaska and with such agencies and organizations of the State as the Governor may designate (including but not limited to the Alaska Council on Science and Technology) with respect to the formulation of Arctic science policy.

(b) Not later than January 31 of each year, the Council shall—

(1) publish a statement of goals and objectives with respect to Arctic research to guide the Arctic Research Commission in the performance of its duties; and

(2) submit to Congress a report describing the activities and accomplishments of the Council during the immediately preceding calendar year.

COOPERATION WITH THE COUNCIL

SEC. 5. (a)(1) The Council may acquire from the head of any Federal agency unclassified data, reports, and other nonproprietary information with respect to Arctic research which the Council considers useful in the discharge of its duties.

(2) Each such agency shall cooperate with the Council and furnish all data, reports, and other information requested by the Council to the extent permitted by law.

(b) The Council may utilize the facilities and services of any Federal agency (with the consent of the appropriate agency head, with or without reimbursement), taking every feasible step to avoid duplication of research and effort.

ARCTIC RESEARCH COMMISSION

SEC. 6. (a) There is established a commission to be known as the Arctic Research Commission (hereafter in this Act referred to as the "Commission").

(b)(1) The Commission shall be appointed by the Arctic Science Policy Council and shall be composed of the following members:

(A) Four members shall be appointed from among individuals with expertise in representative areas of research relating to the Arctic (including, but not limited to, the physical, biological, and social sciences), at least one of whom shall be employed by the University of Alaska.

(B) Two members shall be appointed from among residents of the Arctic who are representative of the needs and interests of Arctic residents and live in areas directly affected by Arctic resource development.

(C) Two members shall be appointed from among individuals familiar with the Arctic and representative of the needs and interests of private industry undertaking resource development in the Arctic.

(D) One member shall be appointed from among individuals familiar with the Arctic and employed by the United States Coast Guard.

(2) Upon the appointment of the members of the Commission pursuant to paragraph (1), the Council shall designate a member of the Commission to be chairperson of the Commission.

(c)(1) Except as provided in paragraph (2), the term of office for a member of the Commission shall be four years.

(2) Of the members of the Commission originally appointed under paragraph (1) of subsection (b)—

(i) two shall be appointed for a term of one year;

(ii) two shall be appointed for a term of two years;

(iii) two shall be appointed for a term of three years; and

(iv) three shall be appointed for a term of four years.

(3) A member may serve after the expiration of his term of office until the Council appoints a successor.

(d)(1) A member of the Commission not otherwise employed by the United States shall be compensated at a rate equal to the daily equivalent of the rate for GS–16 of the General Schedule under section 5332 of title 5, United States Code, for each day such member is engaged in the

actual performance of his duties as a member of the Commission.

(2) A member of the Commission who is an officer or employee of the United States or the State of Alaska shall serve without additional compensation.

(3) All members of the Commission shall be reimbursed for travel (in accordance with section 5701 of title 5, United States Code) and other necessary expenses incurred by them in the performance of their duties as members of the Commission.

(4) No member may be compensated for more than one hundred and eighty days of service each year in performance of his or her duties as a member of the Commission.

DUTIES OF COMMISSION

SEC. 7. (a) The Commission shall—

(1) survey Arctic research conducted by Federal and State agencies, the University of Alaska and other universities, and other private and public institutions to determine priorities for future Arctic research, and make recommendations thereon to the Council and other interested parties;

(2) establish a data collection and retrieval center for Arctic research (which shall be located in the State of Alaska) and promulgate guidelines for the use and dissemination of Arctic research information;

(3) make grants for such Arctic research as the Commission deems necessary and desirable to further the goals and objectives published annually by the Council pursuant to section 4(b)(1), with special consideration being given to studies in neglected areas of Arctic research; and

(4) consult the Council with respect to—

(A) all proposed, ongoing, and completed research programs and studies funded by the Commission,

(B) recommendations proposed by the Commission with respect to future Arctic research, and

(C) guidelines for awarding and administering Arctic research grants.

(b)(1)(A) Not later than December 31 of each year, the Commission shall transmit to the Council a report describing the activities and accomplishments of the Commission during the immediately preceding calendar year and making recommendations with respect to future Arctic research policy.

(B) Such report shall be available for public inspection at reasonable times.

(2) Not later than March 31, 1983, the Commission shall submit to Congress and to the Legislature of the State of Alaska a report making recommendations with respect to the continued operation of Government-operated laboratory

facilities conducting Arctic research, taking into account the efficiency and effectiveness of such facilities and the degree to which the operation of such facilities would result in the duplication of research and effort.

(c) The Commission shall cooperate with the Governor of the State of Alaska, and with such agencies as the Governor may designate (including but not limited to the Alaska Council on Science and Technology) with respect to—

(1) the recommendations proposed by the Commission pursuant to section 7(a)(4)(B);

(2) the planning, funding, and logistical support of Arctic research; and

(3) the storage, transfer, and dissemination of Arctic scientific and technological knowledge and data.

ADMINISTRATION OF THE COMMISSION

SEC. 8. The Commission may—

(1) in accordance with civil service laws and subchapter III of chapter 53 of title 5, United States Code appoint and fix the compensation of an Executive Director and such additional staff personnel as may be necessary;

(2) procure temporary and intermittent services as authorized by section 3109 of title 5, United States Code;

(3) enter into contracts and procure supplies, services, and property; and

(4) enter into agreements with the General Services Administration for procurement of necessary financial and administrative services, for which payment shall be made by reimbursement from funds of the Commission in such amounts as may be agreed upon by the Commission and the Administrator of the General Services Administration.

STATE ELECTION

SEC. 9. (a) The State of Alaska may elect to participate or not to participate in the activities of the Council and the Commission.

(b) Failure of the State of Alaska to contribute to the Arctic Research Fund (established by section 10 of this Act) for a fiscal year an amount equal to one-quarter of the amount appropriated to such Fund by the United States for the previous fiscal year shall constitute an election by such State not to participate in the Council and the Commission.

(c) Upon an election by the State of Alaska not to participate in the Council and the Commission pursuant to subsection (b)—

(1) appointments to such Council or Commission which are required to be made from among individuals—

(i) employed by the State of Alaska, or

(ii) nominated by the Governor of the State of Alaska

shall be vacated; and

(2) an appointment to fill a vacancy created by such election shall be made in such manner and from among such individuals as other appointments to such Council or Commission are required to be made (as determined by the chairperson of the Council or Commission).

(d) An election by the State of Alaska not to participate in the Council and the Commission pursuant to subsection (b) shall not affect the powers or duties of those bodies.

(e) Should the State of Alaska wish to reinstate its participation following an election not to participate, it may do so by meeting the funding requirement for the year in which reinstatement is sought.

ARCTIC RESEARCH FUND

SEC. 10. (a) There is hereby created a trust fund to be known as the Arctic Research Fund (hereafter in this Act referred to as the "Fund"), to be available for the support of the activities of the Arctic Science Policy Council and the Arctic Research Commission.

(b) Such Fund shall consist of—

(1) amounts appropriated to such Fund;

(2) amounts contributed to such Fund by the State of Alaska;

(3) amounts contributed by private individuals and organizations.

(c) Amounts in the Fund shall be available, until expended, for the purposes of this Act, to the extent and in such amounts as are provided for in advance in appropriation Acts.

(d)(1) There is authorized to be appropriated for the Arctic Research Fund for the fiscal year beginning October 1, 1983, and for each succeeding year thereafter, $25,000,000.

(2) In determining the amount contributed to such Fund by the State of Alaska for a fiscal year—

(A) the fair market value (as determined by the Council in good faith) of all facilities, services, materials, and other support contributed to the Fund by the State of Alaska during such fiscal year, and

(B) all amounts contributed by private individuals and organizations,

shall be taken into account.

DEFINITION

SEC. 11. The term "Arctic" shall mean all United States and foreign territory north of the Arctic Circle and all United States territory north and west of the boundary *formed by the Porcupine, Yukon, and Kuskokwim Rivers; all contiguous seas, including the Arctic Ocean and the Beaufort, Bering, and Chukchi Seas; and the Aleutian chain.*

NONAPPLICABILITY OF NEPA

Sec. 12. The National Environmental Policy Act of 1969 shall not be construed to require the submission of environmental impact statements for any activities conducted pursuant to this Act.

United States Arctic Science Policy

by

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Gunter Weller
T. Neil Davis
Vera Alexander
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Alaska Division, American Association
for the Advancement of Science

February 1981

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UNITED STATES ARCTIC SCIENCE POLICY

INTRODUCTION

During the past 30 years the importance of northern and arctic science has been largely ignored and neglected at a time when this nation has stepped up its use and occupancy of the North in response to growing national resource needs. The critical need now, of course, is to alleviate the nation's energy problems. This imperative, however important, should not and need not be an excuse to run roughshod over proper procedures and good science. In the long run, a well-thought-out and integrated arctic science policy would guarantee the best management and use of the Arctic's diverse resources—natural, strategic, and human.[1] During the past three decades government basically has paid "lip service" to this concept with token and procedural programs in arctic science. Governmental coordination, priority determinations, and sporadic pronouncements concerning arctic science have, in effect, been a farce in every sense. The nation simply cannot afford any longer to be complacent in its approaches to the acquisition of arctic knowledge.

Clearly, the time for a renaissance in arctic science is now. We need a strong and cohesive U.S. arctic science policy to guide national program effort in resource development, international relations, defense, environmental protection, and human health. A coherent U.S. science policy would contribute to the solution of the following national and regional problems which now adversely affect the well-being of the nation.

1. Delays in energy resource development
2. The unhealthy state of the U.S. economy
3. The low status of the United States among nations active in the Arctic
4. Lack of economic infrastructure to more fully utilize North Pacific fisheries resources

5. Lack of appropriate facilities and logistic capabilities to support both science and industrial development in the arctic region
6. Insufficient education and training of enough arctic scientists and technologists to fulfill national needs in the region
7. Conflicts between indigenous peoples and governmental and resource development interests in the Arctic
8. Conflicts between environmental and development interests in the Arctic
9. Critical health, trauma, and morbidity conditions among arctic occupants

In this paper we first review past U.S. efforts to establish arctic science policies designed to promote fulfillment of national needs. Second, we discuss within an arctic context the relationships of science to natural resource development, environmental protection, national defense, understanding climatic change, enhancement of human life and occupancy, and the Arctic as a scientific research laboratory. Finally, we offer the case for legislative action as the essential policy foundation for the development of coherent and comprehensive programs to achieve national objectives in the arctic region.

HISTORICAL PERSPECTIVE

Throughout history, U.S. government policies concerning the Arctic have been reactive to special interests and events. The conduct of U.S. arctic affairs during the past 20 years (1960-1980) is most germane to the need for a forum on arctic affairs today, but earlier history serves to set the stage for more recent events.

Prior to and during the nineteenth century, the federal government provided little policy direction pertinent to activities in the North. Exploitation of resources worldwide was the rule. In this context U.S. interests shared or led the rush to reap the riches of the Arctic—

furs, fisheries, whales, gold, and other minerals.[2] The Arctic was explored in order to more efficiently exploit its economic resources. Scientific inquiry into arctic environments, indigenous peoples, and high-latitude phenomena was incidental. Often during these times, scientific and exploration activities of U.S. organizations, citizens, and government employees received little direct official support and sometimes engendered actual opposition.[3] Westward expansion, or "manifest destiny," was the driving force, and the goals were the economic imperatives of the times. Nevertheless, by the turn of the century, scientific knowledge of the arctic region had greatly increased,[4] and a number of humanistic and progressive economic policies toward indigenous peoples had been adopted.[5]

By the 1920's, there was a further increase in the breadth of arctic scientific inquiry, setting the stage for several major policy-shaping events. Based largely on Ernest Leffingwell's identification of major oil structures on Alaska's Arctic coast, President Warren G. Harding established Naval Petroleum Reserve No. 4 (NPR-4) by executive order in 1923.[6] Eastward, between the Greenland and Barents seas in the Svalbard Archipelago, the United States agreed to the concept of international sharing of offshore resources.[7] Finally, the experiences and writings of one man, Vilhjalmur Stefansson, created an intellectual appreciation for the arctic technologies of indigenous peoples and explained them in the context of Western science. Most importantly, he convinced people throughout the world that the Arctic was not as forbidding as most believed.[8]

As the clouds of World War II gathered, the United States had taken only sporadic and partial actions to develop policies dealing with resource exploration in the North and the equitable relations with arctic Native peoples. Little thought was given to defense strategy in the Arctic and sub-Arctic, to the sociopolitical and cultural values of Native people, to transportation and communication in and over the arctic lands and waters and, of course, to pertinent environmental protection as we know it today.

During the post-World War II era of the late 1940's and the decade of the 1950's,[9] diverse agencies did develop piecemeal policies on many of these subjects, but they lacked cohesion. During this period three sets of events gave impetus to U.S. arctic science activity. These were (1) the exploration of NPR-4 from 1946 to 1953, the concurrent establishment of the Naval Arctic Research Laboratory (NARL) at Pt. Barrow, Alaska, plus the development of the Air Force Research and Development Command's Project 572, Distant Early Warning (DEW) line; (2) the 1957 International Geophysical Year (IGY) program; and (3) commitment of the U.S. Indian Health Service to eliminate or reduce the incidence of tuberculosis and environmentally associated disease in the populations of Alaska Natives.[10]

Exploration of NPR-4 focused on geological investigation of the Alaskan Arctic and laid the foundation of knowledge necessary for the later (1968) discovery of oil at Prudhoe Bay.[11] Activities in the biological fields at NARL developed understandings of the tundra vegetation, physiology of arctic animals, and the life history of northern fishes. Meanwhile, the doctors and biologists of the Indian Health Service and the Arctic Health Research Center of the Public Health Service conducted investigations and research on a broad array of endemic disease, environmental health, and genetic problems, thereby effectively reducing disease and mortality among indigenous peoples.[12] In the physical sciences, high-latitude atmospheric phenomena became better understood,[13] forming the foundations for improved arctic communication and air transport. Oceanographers began systematic inquiry into arctic seas, and meteorologists pursued studies of the arctic climatic regime and its global effects.[14] All of these activities resulted in the development of a small cadre of skilled and dedicated arctic scientists and the foundation of knowledge necessary to understand and live and work in the arctic environment.

The decade of the 1960's was one of great change in the Arctic itself and in national events affecting U.S. interests in the North. Nationally, the 1960's brought an awareness of scientific deficiencies, particularly within the scientific community and the Congress of the United States. As a result, increased attention was given to environmental, ocean, and space sciences. Congress passed numerous laws to elevate the national posture and awareness in these areas of concern.[15] Several studies, reports, and actions within the executive branch, particularly emanating from the President's Science Advisory Council and the Office of Science and Technology, complemented the congressional sense of urgency about these topics of national importance.[16]

In Alaska the disastrous 1964 earthquake brought about an economic and societal recovery effort which greatly enhanced Alaska's well-being. Following that event, Alaska began to contribute to the national economy instead of, as before, being almost completely dependent upon federal largess. The economic development brought about by postearthquake recovery and oil industry exploration (based on earlier NPR-4 investigations) culminated in the 1968 discovery of the nation's largest oil field on the arctic coast at Prudhoe Bay.[17] These events placed new demands on arctic science and technology. The few existing scientists with experience in arctic environments—permafrost construction, the dynamics of coastal ice forces, fisheries and wildlife, soils and vegetation—were in great demand by both industry and government. They participated and directed a new thrust in arctic science and technology applied to natural resource recovery, improved arctic communities, and transportation and communication development. Suddenly arctic science had new reason for being, even though many with foresight had seen the imperatives years earlier.

In the vanguard were Alaska's then-Senator E.L. "Bob" Bartlett and Joseph Fitzgerald, Chairman of the unique Federal Field Committee for Development Planning in Alaska.[18] Senator Bartlett served on the Appropriations Committee of the U.S. Senate. In that role he often compared U.S. funding of the antarctic research program with national allocations to arctic science. Bartlett reasoned that U.S. arctic interests, involving potential natural resource developments and the lives and conditions of the region's peoples, deserved at the very least the same national attention as those in Antarctica, albeit the national interests in the two polar regions were based on different rationales.[19]

Bartlett and Fitzgerald decided to do something about this disparity. Bartlett commissioned the Legislative Reference Service of the Library of Congress to prepare a report on the scope of U.S. arctic research,[20] and he requested that Fitzgerald implement a process to develop arctic policy within the federal executive branch. Chairman Fitzgerald prepared an initial broad statement of U.S. arctic policy and initiated discussions in 1965 with the heads of departments and agencies in Washington, D.C. Although this policy statement contained economic and societal elements, particularly involving indigenous people, it dealt strongly with the need for the conduct of coherent arctic scientific programs in all disciplines prerequisite to exploration for natural resources, their production and delivery, and environmental understanding of the arctic region generally.

The scientific content of the policy statement brought about a continued dialogue between the Federal Field Committee and the National Science Foundation. Ultimately, after diverse efforts, a U.S. policy statement was agreed to by all agencies concerned and forwarded to President Johnson in 1968. President Johnson did not act on the statement prior to leaving office, however.

Although the effort to secure a presidential pronouncement of U.S. arctic policy failed in 1968, the Interagency Arctic Research Coordinating Committee (IARCC) was established that year at the request of the Department of State in agreement with the Office of Science and Technology and the Federal Council for Science and Technology (FCST). Later, in 1972, it was reconstituted as an interagency committee of the FCST, and the National Science Foundation was given a lead role. The primary purpose of the IARCC was to insure sound and rational development of arctic research through effective coordination of federal research programs and available logistic resources to support those programs and through the development of mutually beneficial cooperative research projects in the Arctic between the United States and other nations. Unfortunately, the record of IARCC from 1968 to its termination on June 30, 1978 turned out to be but a relatively ineffective shadow of the substance desired by Bartlett and Fitzgerald. The reason was simple—there was no overall policy guidance within which the committee could operate.[21]

At about this same time during 1968 and 1969, other events brought new focus to arctic science. The Congress was preparing new legislation, later to be entitled The National Environmental Policy Act (NEPA). Within the executive branch the National Oceanographic Program was being implemented through the provision of the Marine Resources and Engineering Development Act of 1966. In Alaska, economic recovery from the 1964 earthquake was taking form and substance despite a minor national recession in 1967. The big news came in the fall of 1968. The nation's largest oil field had been discovered on the arctic coast at Prudhoe Bay, Alaska.[22] Finally, too, after two years of study and analysis the Federal Field Committee's reports to the Congress on needs and means to resolve the aboriginal land claims of Alaska Natives was receiving greater attention.[23] Collectively, these events interacted and came into even sharper focus and interdependency as the problems presented by proposed construction of the trans-Alaska pipeline and tanker traffic from Alaska's ice-free Prince William Sound port of Valdez to the conterminous states became evident.

The problems of massive arctic marine, air, and terrestrial logistics, made even more apparent this nation's serious dearth of knowledgeable individuals experienced in arctic environments. Pipeline construction was a particular case in point. The pipeline plans originally conceived by industry engineers and presented to the U.S. Senate Committee on Interior and Insular Affairs in May 1969 called for a buried pipeline throughout its entire length except for 12 miles. The naivete of these plans was quickly pointed out by scientists from the U.S. Geological Survey, Cold Regions Research and Engineering Laboratory of the U.S. Army Corps of Engineers, and the University of Alaska, but they were largely ignored during the initial excitement. The December 1969 passage of NEPA added a new dimension. The pipeline project became the first major test of the new act. A broad public process and dialogue took place in the development of environmental impact assessments.[24] Significant scientific input was required regarding pipeline construction under arctic permafrost conditions and immediate and long-term effects of pipeline construction and operation on fish and wildlife resources, vegetation, erosion, and other natural surface values as well as the structural integrity of the pipeline itself. Many of these studies continue today.[25]

Governor Walter Hickel was pushing on the Alaska political front for increased development of arctic Alaska. He created the North Commission, which had explicit arctic mineral development and transportation objectives. Then, learning of the initiatives of Federal Field Committee Chairman Fitzgerald in arctic policy, Hickel brought these needs to the Republican convention of 1968, and for the first time U.S. arctic interests were incorporated in a major political platform. Later, in October 1969, Hickel, newly appointed Secretary of the Interior in the Nixon administration, convened the "Skyline Conference" (so called due to its convenance at Skyline in Shenandoah National Park). The major objective of the conference was to define the role that the federal government should take towards insuring a balance between exploitation of arctic resources and the protection of the land and the people of the North. But Secretary Hickel soon left the Nixon administration, and arctic interests were again stymied. One last surfacing came about in the third report of the President to the Congress on marine resources and engineering development in *Marine Science Affairs—A Year of Broadened Participation, 1969.*[26] In this report parts of the earlier Federal Field Committee statements were combined with IARCC and National Council on Marine Resources and Engineering Development contributions to set forth a recommendation for a national arctic policy. Eleven years later this statement remains the clearest expression of U.S. arctic objectives.

Finally, in 1971, Under Secretary of State Irwin forwarded a renewed statement of U.S. arctic policy to the president for consideration, but efforts to give direction to U.S. arctic science failed again. All official government dialogue on the subject was effectively quelled by National Security Decision Memorandum 144 of the National Security Council on December 22, 1971.[27] This memorandum called for an Interagency Arctic Policy Group to be established and for "the development of a coordinated plan for scientific research in and on the Arctic . . ." There is no record that the policy group ever met, and although IARCC prepared its *Five-Year Coordinated Plan for Arctic Research*,[28] this report had many acknowledged deficiencies and could hardly be considered to meet the mandate of NSC Memorandum 144.

In 1972 there was yet another attempt to influence the course of arctic science direction by examining the potential environmental effects on the development of Alaska's North Slope. Under the aegis of the National Academy of Science, an *ad hoc* planning group under the leadership of Dr. Walter O. Roberts, then director of the National Center for Atmospheric Research, brought together and published recommendations in the fields of arctic science and technology.[29] Again, this effort did not produce any significant results.

Effectively, by 1972, after eight years of activity emanating from several governmental, political, economic, and scientific sources, efforts to develop coherent U.S. arctic policy were dead. But resource development and social change in Alaska, and indeed across the entire circumpolar Arctic, were increasing in both scope and speed. Government responded with many disparate, piecemeal program endeavors. The efforts given to an analysis of Alaska Native land claims between 1966 and 1971 gave added impetus to programs of research and investigations in the health sciences and housing, water supply, and waste treatment technologies relative to indigenous peoples and their communities.[30] A number of new laws also emerged, governing fish and wildlife resources, including rare and endangered species and marine mammals. These activated new investigations on arctic flora and fauna, particularly where conflicts with resource developments were perceived.[31]

Three major arctic science programs, each portending a semblance of scientific coordination, began in or near Alaska in 1970. The Alaska Sea Grant Program undertook a number of research efforts in arctic marine and coastal resources and environments. The Tundra Biome Program, sponsored by the National Science Foundation, was launched to render new understandings of tundra ecosystems through interdisciplinary study[32] as part of the U.S. participation in the International Biological Program. The Arctic Ice Dynamics Joint Experiments involved study of ice movements, forces, and effects in the Arctic Basin.[33] A fourth program, the Greenland Ice Sheet Project, collected paleoclimatic data from deep bore holes in the Greenland ice sheet. Despite their potential interrelationships, very little interprogram coordination took place in the Alaska-sited programs. Disturbed by this fact and concerned by the obviously unmet needs for coordinated new directions in arctic science, the Alaska Sea Grant Program and the National Science Foundation in 1974 sponsored a workshop to help develop a new "Arctic Offshore Program."[34] The program was to be a new major initiative of the NSF, and its formulation recognized the "lead agency" role in arctic science assigned to NSF by executive order.

As program and funding plans were being developed for this coordinated effort, the U.S. Department of Interior, Bureau of Land Management (BLM) entered into agreement with the National Oceanographic and Atmospheric Administration (NOAA) for the assessment of outer continental shelf (OCS) environs prerequisite to the BLM's leasing of the OCS for oil and gas. Major components of the resulting Outer Continental Shelf Environmental Assessment Program (OCSEAP) were studies in the Gulf of Alaska, Bering Sea, and the Beaufort and Chukchi basins. Appropriation levels were high enough so that a large program effort developed, utilizing much of the nation's northern and arctic scientific capability within universities and federal and state agencies. As OCSEAP progressed, criticism of the scientific direction of the program surfaced both within and outside government. The BLM and NOAA often disagreed on program directions, and research results were generally poorly synthesized with existing OCSEAP and other research programs' results. Often, too, as a particular research component neared completion and a satisfactory contribution to man's knowledge made, funds would be shifted to another investigation before the nearly completed work reached an acceptable scientific conclusion.

This kind of "crash" research program, at great public cost, epitomizes current governmental science efforts. They may appear to meet agency procedural and legal requirements, but they contribute little to environmental understandings of articulated objectives or increasing knowledge. Unfortunately, there are other examples in government of "science" for procedural or mission support purposes. Studies of the environment of the National Petroleum Reserve in Alaska (NPRA), mandated by the Naval Petroleum Reserves Production Act of 1976 (P.L. 94-258), were very costly and added little to existing environmental knowledge except in structural geology pertinent to oil and gas resources. In this case the gathering and republication of existing knowledge and the education of government personnel were the essential products of NPRA studies rather than any substantial new information regarding surface resources and environments of the arctic coastal plain, arctic foothills, and Brooks Range of Alaska.

With the passing of the 1970's the general inefficiencies of arctic science programs and the great wastes in money, manpower, and materials in relationship to the advancement of man's arctic knowledge became increasingly apparent. The history of U.S. arctic science over the past 20 to 30 years offers a montage of good, bad, and indifferent science performed at many scales but generally at high cost in relation to results.[35] Duplication of effort, replication of earlier work, poor knowledge synthesis, lack of direction to identify and fill gaps in knowledge, and "crash" research programs motivated by agency procedural requirements characterize these efforts. The result of lack of policy direction and program coordination is even more serious than wasted manpower and dollars because the ability of the United States to meet broader economic, societal, and national security purposes is also directly affected.

Importantly, this lack of foresight and concern about arctic matters in the United States is also clearly recognized by other nations. Dr. Tore Gjelsvik, director of the Norwegian Polar Institute in Oslo, wrote recently:

> In contrast to Antarctica, the international scientific cooperation in the Arctic is rather poorly developed and organized. On the national level, arctic science is differently developed. The Soviet-Russian organization and institutes charged with exploration and scientific studies are larger than the biggest in the west, and they carry out a large and systematic study of not only the Soviet arctic coasts and islands, but over the whole central arctic. The Soviet arctic technology is well developed, and the transportation system—consisting of powerful ice-

> breakers and aircraft—is superior to that of the west. The Arctic and Antarctic Institute of Leningrad is the central polar organization, but in addition, many specialized agencies or institutes have been established. More than 20,000 scientists must be involved in arctic studies on the Soviet side.
>
> In the biggest arctic nations in the west, their polar research, although increasing in size and quality, is rather poorly coordinated. Neither USA nor Canada has established a central organization for arctic science. This also makes international cooperation and coordination difficult. Arctic science in the west has grown considerably since the discovery of oil and gas in the American Arctic but is still lagging behind the Soviet one. If the gap is not bridged, or at least diminished, there is a danger of unwanted consequences of future political and legal arrangements within the central Arctic.[36]

Dr. Gjelsvik concluded by urging the Western governments to increase funds for arctic science and to coordinate their efforts on an international level. We heartily concur.

THE RELATIONSHIP OF U.S. SCIENCE POLICY TO NATIONAL NEEDS AND OBJECTIVES IN THE ARCTIC

Arctic Issues and Their Importance

The arctic science community is besieged by a wide range of demands to provide information and solve problems, both real and perceived, for a host of national interest programs. In today's world the economics of northern resource development occupy the center stage of arctic events. In part this reflects the discovery of immense oil and natural gas deposits in the region and technological advances that make their development feasible, but it also emphasizes man's seemingly insatiable appetite for energy, the depletion or uncertainty of customary sources of supply, and the sharp upsurge in international price levels for petroleum. The most apparent problems involve natural resource exploration, extraction, and transportation and the resolution of legal challenges on a number of environmental-developmental conflict fronts, including those with traditional resource use by indigenous people. Others, such as cold weather medicine for both military and civilian use, advanced work in space, atmospheric and submarine communications, climatic change, and the development of new ship and aircraft technology, serve to illustrate the broad reliance on science and technology to deliver the answers that can help satisfy national needs in the Arctic.

In view of these trends, it seems as if arctic resource development should be proceeding much more rapidly than it is, particularly in the energy-starved and inflation-beleagured United States. Although many barriers to arctic development for the United States have fallen, several problems and constraints remain. On the one hand, world economics are more favorable, aboriginal claims are settled in Alaska, a framework for the political resolution of Alaska land status has been achieved, and regulatory reform is under way. On the other hand, the scientific and industrial communities in many cases lack the site-specific information base to apply existing workable technologies. In other cases there is lack of basic knowledge prerequisite to the design of new and acceptable developmental approaches. Additional constraints and issues spring from an increased awareness and concern over the impact large-scale developments may have on sensitive arctic natural systems and upon indigenous peoples and the resources and environments they depend upon.

So far, energy resource exploitation has been directly connected with developed and developing fields in areas where territorial sovereignty is generally recognized by all governments concerned. Thus, little political dispute of a jurisdictional nature has resulted. Some political and legal uncertainty nevertheless exists as to the offshore extent of coastal state jurisdiction over the arctic seabed and superjacent waters, an area believed to contain immense hydrocarbon reserves. Agreement is lacking on the delimitation of continental shelf boundaries between several adjacent nations and on the scope of coastal state rights to regulate shipping and other activities beyond territorial waters. For example, in the Svalbard area the situation is made more difficult by a lack of agreement over access to the mineral resources of the continental shelf, and just north of St. Lawrence Island between the USSR and the United States a triangular no-man's land exists under the present law of the sea.

This lack of jurisdictional resolution has strategic as well as political and economic implications inasmuch as the vital energy resources have added to the strategic relevance of the Arctic. The possibility of arctic tanker traffic, the advent of the nuclear-powered submarine, and the massive buildup of the Soviet fleet along the Barents Sea have enhanced the importance of the Arctic Ocean as a transit area. The situation is particularly sensitive with regard to the entrance to the Barents Sea, where the Soviets might view offshore petroleum development as a restriction to the free passage of their northern fleet. The extension in 1977 of 200-mile economic zones to all arctic coastal waters also opens new possibilities for disagreement, especially should the coastal states expand their substantive jurisdiction within their claimed zones.

To be able to exploit arctic resources, legally, economically, and in an environmentally acceptable fashion; to conduct military operations in the area; and to represent its interests in the Arctic intelligently and from an informed basis, the United States must have a substantial and well-coordinated scientific research program in the Arctic. Such a program does not presently exist, neither does a coherent policy on arctic research nor any priority sense of purpose. Consequently, the United States has only very limited arctic scientific and technological expertise and capability. Only a strong, stable, long-term science effort can supply the answers needed now and to train a generation of future arctic scientists.

Natural Resources

Worldwide demand for energy, food fiber, and other materials grows continuously in response to increasing numbers of consumptive markets. Particularly acute demand exists for such resources as oil and gas, strategic and critical minerals, and fisheries. The use and management of other resources, such as marine mammals, terrestrial wildlife, birds, and water, are also affected by the extraction and exploitation of the resources of primary interest.

OIL AND GAS

In every sense the U.S. requirement for oil is the most acute national need to be partially met from arctic regions. U.S. need for this resource is so pervasive that it is beyond comprehension that the nation has not already marshaled its wealth and know-how—scientific and otherwise—to assure rapid delivery of petroleum. The Central Intelligence Agency recently reported that total oil supplies available to the Western industrial countries (over the next few years) are unlikely to increase significantly and may well fall.[37] Further, according to the General Accounting Office, the United States has experienced a net decline in domestic petroleum output since 1970, and it is estimated that domestic production will fall from 10.1 million barrels per day in 1978 to 8.0 in 1990, remain level through about 1995, then increase to about 8.5 million barrels per day by 2000, "*depending largely on how the Alaska dilemma is resolved.*"[38] (Emphasis added by authors.)

Just what is the Alaska dilemma; or, more precisely, what is the arctic dilemma? We know that it is in arctic Alaska and Canada and their offshore waters that the greatest potential for significant increase in U.S. and North American oil production exists. Development of arctic petroleum resources will undoubtedly occur, partly because these resources appear to be huge and partly because of uncertainties in the customary Middle East supplies and sharp increase in price levels. What, then, is holding us back? Some additional background will facilitate understanding.

During the last decade major oil and gas deposits have been discovered along the northern fringes of Alaska, Canada, and the Soviet Union. Exploitation of several of these land areas is under way (including Alaska's Prudhoe Bay, the largest oil field in North America), but the development of new offshore areas will require huge new investments and further advances in technology. The Prudhoe Bay field presently produces close to 1.5 million barrels of oil per day, or nearly 20 percent of total U.S. production. Importantly, the U.S. Geological Survey estimates that, added to already proven reserves, Alaska's recoverable totals are from 22 to 59 billion barrels of oil and 61 to 164 trillion cubic feet of gas. Offshore areas appear more promising for both oil and gas than do land areas, and offshore development in the Beaufort Sea has begun. In addition, planning for petroleum development by both industry and government is well under way for basins within the Chukchi and Bering seas. Canadian oil and gas reserves are concentrated in two main basins—the Mackenzie Delta/Beaufort Sea near Alaska and the Sverdrup Basin within its high-arctic island geography. More than half of the reserves in both areas is believed to lie offshore. (Development of these basins already portends territorial and environmental conflict with U.S. interests from proposed transportation systems using ice-breaking tankers. Elsewhere in the Arctic, near Greenland and Svalbard, exploration that also has potential effects on U.S. interests is proceeding.)

The dilemma is created by the fact that we do not currently have the knowledge and technical capability, regardless of industrial capital expenditure or escalated lease sale schedules, to solve many necessary exploration, production, and delivery problems immediately. Sustained commitments from both government and industry would have to be made in scientific investigation and training if the information necessary for design of arctic oil production and delivery systems and related environmental protection are to be forthcoming. This must be achieved before serious decline of U.S. domestic oil and gas production a decade hence.

The Alaska Natural Gas Transportation System is an excellent onshore case in point. Despite years of planning, scientific and technological research has just begun to attempt to answer several questions pertinent to the burying of a cold gas pipeline in certain permafrost soils, in soils subject to differential frost heave, and under particular conditions of groundwater movement. Obviously, this lack of knowledge has a tremendous effect on design, costs, and security factors necessary to complete planning and construction of this project.

Offshore, exploration and future production facility design in all basins north of the Aleutians is severely hampered by lack of data on ice characteristics and dynamics, information on currents and sediment transport, knowledge of the occurrence of subsea permafrost, and data on superstructure icing and storm occurrence. Operating offshore drill rigs in the ice-covered waters of the Arctic in a safe and environmentally acceptable fashion is difficult and costly. The numerous natural hazards in the Arctic, particularly sea ice, make a cautious approach, in which technologies and environmental procedures are continually being tested and improved, mandatory. Petroleum companies operating on arctic continental shelves have found accurate forecasting of sea ice behavior to be indispensable. The normal hazards of offshore drilling are magnified many times by the wide variations in weather and ice conditions. Pipelines from drilling platforms to shore are subject to rupture by the scouring action of massive pressure ridges and ice islands, and enormous forces can build up on the drilling platforms as the moving ice piles up against it. Without such information the construction of offshore, year-round production facilities is impossible.[39]

Another problem related to offshore operations in all basins under current statute is that many voids currently exist in baseline biological data needed for impact assessment to fisheries and to marine mammals and bird life, several species of which are classified as rare or endangered. Without these data, particularly beyond nearshore environs, offshore production operations may be legally unacceptable. Equally important, production operations would create major economic and political conflicts with national and international fisheries interests.

Presumably, production of nearshore and offshore petroleum resources would follow the present exploration phase. This would bring a flurry of new activities and problems, particularly those related to transport. Both pipelines and shipping, including ice-breaking oil and LNG tankers, would be used to transport the oil and gas to markets. Sea ice conditions present serious hazards to shipping. Forecasting of ice occurrence and movement are prerequisite to expanded shipping in the Arctic.

The ideal situation is for needed technological and environmental research to precede development. In reality, development not only often drives the pace of research, it races ahead of it. Recognizing this mismatch and concerned with the requirements of frontier area leasing schedules, the Alaska Oil and Gas Association, an industry consortium of major companies active in Alaska petroleum development, drew up in 1974 a list of research priorities, which has been refined in succeeding years. The association's perception of critical data gaps for the next decade is that they increase in number and severity from the nearshore ice to the offshore pack ice zone. They include such conditions or occurrences as ice movement during freezeup, winter ice movement, summer pack ice invasions, presence and movement of multiyear floes and ridges, grounded ridges and icebergs, and ice gouging of the ocean floor. Permafrost under the sea, waves, storm surges, and superstructure icing are additional hazards. The association's recommendations received wide distribution within the federal government, but due to fiscal constraints only limited program response has resulted.

Similarly, a 1973 U.S. Maritime Administration timetable for development of arctic shipping technology, developed in concert with U.S. shipbuilders, has fallen at least five years behind schedule. Arctic shipping is feasible, as has been demonstrated by the Soviet Union along its heavily used Northern Sea Route and by one of its ice breakers reaching the North Pole as well as by the voyage of the supertanker *Manhattan* through the Northwest Passage. What is needed is a real-time forecasting system that matches Soviet practices.

Equally important is protection of the arctic environment and subsistence life-styles of the indigenous people. Abundant biological resources, including fish, birds, seals, walrus, whales, and polar bears, are potentially threatened by petroleum development and related activities. In turn, their decline could mean the demise of an entire human culture. The adequacy of information to fully consider the broad effects of petroleum development off the Alaskan arctic coast has already been successfully challenged in U.S. courts on procedural grounds. It is important to realize that most of these data needs are also essential to facility design and operation. Without a committed and planned research program by both industry and government and a strong policy direction, these scientific and technological gaps could not be filled, even if all other economic, political, regulatory, and societal barriers were overcome.

COAL AND STRATEGIC AND CRITICAL MINERALS

The arctic circumpolar region holds tremendous stores of useful minerals, ranging from gemstones to fertilizers. Mining development in the Arctic, however, is more costly than in other regions and is often feasible only when transportation, energy, and manpower requirements of extraction can be economically met. As the United States is increasingly denied access to world mineral resources elsewhere and as transportation and energy availability in the Arctic improve with increased petroleum development, the prospects of mineral extraction in the region will also improve.

Although Alaska contains vast coal reserves and numerous occurrences of strategic and critical metals,[40] only a few currently appear to be economically competitive in the world market. They are:

1. A group of mineral prospects for zinc, lead, and silver near the headwaters of the Wulik River north of Noatak known as Lik, Southeast of Lik, Red Dog, and South Red Dog
2. A group of copper prospects in association with silver, lead, zinc, and antimony in the Ambler-Bornite area northeast of the village of Kobuk on the Kobuk River (There is another nearby prospect known as Picnic Creek near the headwaters of the Kobuk River, but this does not appear economically viable at present.)
3. Deposits of coking-quality coal along the Kukpowruk River, east of Cape Beaufort and south of Pt. Lay village
4. The Beluga coal fields north of Cook Inlet
5. The currently operational Nenana coal fields
6. The molybdenum prospect known as Quartz Hill at the head of Boca de Quadra Arm in southeastern Alaska
7. A major nickel prospect located at Brady Glacier in the Glacier Bay National Monument[41]

Even given rising economic potential and the lessening of political, land tenure, and regulatory barriers to development, the lack of environmental knowledge and impact predictability, particularly in areas of continuous and discontinuous permafrost and high groundwater content, complicate development. Nearly all of these prospects would require water diversion for development, and the likely impacts of these diversions, with their associated sediment and chemical waste problems, should be evaluated now. Coordinated geological-geophysical studies are needed on the geologic history of Alaska. This history is only beginning to emerge and should be expected to provide a firm background of thinking about the state's mineral resources in the future. Geological mapping should be conducted, particularly in areas of suspected mineralization or in areas which will aid in basic understanding of the geological development of the Alaska region. To date, detailed mapping of only 7% of the state has been completed.

Other arctic nations are presently more active in mineral exploration in their northern lands than is the United States. The Soviet Union extracts far greater quantities of arctic mineral resources than any other country. Deposits of national importance include nickel, copper, platinum, apatite, tin, diamonds, gold, and coking coal. Although mining within permafrost regions is extremely costly, the government of the USSR is willing to develop these areas to gain greater mineral self-sufficiency and to achieve sociopolitical objectives. Mineral production in other arctic areas includes iron ore in northern Sweden, coal on Svalbard, lead-zinc in Greenland, and lead, zinc, asbestos, copper, and other minerals in northern Canada. The overall mineral potential of the Arctic is very great.

If the development of metallic and coal prospects of Alaska is in the national interest for energy, defense, and production purposes, and presumably it is, then policies furthering scientific and technological investigation are prerequisite to progress. To delay these undertakings greatly affects production design and adds unnecessary cost to the capitalization of these developments.

FISHERIES

Arctic seas contain some of the world's oldest and richest commercial fishing grounds. In contrast with the rich upwelling regions associated with important fisheries in other parts of the world's oceans, where fish populations can be related more or less directly to the influx of nutrients and plankton production, in northern high-latitude waters the mechanism for sustaining high yields appears to be local high plankton production associated with oceanic frontal structures and a *short food chain.* An example of this is a series of fronts on the southeast Bering Sea shelf near the shelf break. Here, the highly productive fishery is associated with locally enhanced primary production and a short pelagic food chain. Additionally, local mixing at the Aleutian passes produces local maxima in planktonic growth. On shallower regions of the shelf, much of the phytoplankton production is not grazed in the water column but drifts to the bottom, where it sustains a different food chain involving shellfish and some marine mammals, especially walrus. The retreating ice edge has a major influence over shallow shelf regions in spring. As it melts, a strong zone of water column stability and frontal structure results, creating a burst of plant growth (algae) under the ice. In turn, this plant life supports an abundant food chain.

Of the arctic catch areas, the Bering Sea and the Aleutians are most important with a five-year average (1971-75) of more than 2 million metric tons. Next are the Barents Sea (1.6 million mt), Norwegian Sea (1.1 million mt), Iceland (1.1 million mt), Svalbard (0.4 million mt), and Greenland (0.2 million mt). The percentage of total arctic catch taken by various nations is: Iceland, 93%; Norway, 64%; Federal Republic of Germany, 35%; United Kingdom, 26%; Japan, 16%; USSR, 15%. In the Bering Sea and the Aleutians (the area of greatest immediate interest and concern to the United States) Japan and the Soviet Union catch most of the fish. The U.S. catch, expressed as a percentage of the total five-year catch, is negligible.

A new era of fisheries management began in October 1975, when Iceland extended its exclusive coastal fishing zone to 200 miles. Every other arctic nation has since done the same. All arctic fishing grounds are now under some form of national management. Each nation has sole authority within its fishing zone to determine how much fish may be taken and by whom. For the United States to effectively control and regulate fish catches in the huge areas of the Bering Sea and along the Aleutians, it must have proper scientific information. Since the United States presently has a minimal presence of fish-catching vessels in the area, other means of obtaining the needed information are necessary. Long-term research and monitoring of the fish resources must be part of such efforts.

International consumer demand for marine fish and shellfish from North Pacific (including Bering Sea) waters is increasing. The rate of increase, however, is not equal among the various fishery products available. Two types of fishery products, in terms of the historic U.S. harvest interest, are of concern. First, there are the traditionally sought after species, such as salmon, crab, halibut, herring, and shrimp; and second, there are those species which have been under- or unutilized by the U.S. domestic fleet, such as Pacific Ocean perch, Alaska pollock, sablefish, Pacific cod, and many other rockfish and flatfish species (collectively called groundfish).

American consumer demand for traditionally sought species is comparatively stable. These species have been fished by U.S. fishermen for long periods of time and are generally harvested at maximum sustainable yield levels. If demand for species in this group increased, supply would still be governed by biological limitations. Domestic demand is increasing for under- and unutilized species, but, so far, the U.S. harvest is much less than the quantity of resources available. As of late 1979, U.S. fishermen were expected to take 45,000 metric tons of the 374,750 metric tons considered the optimum yield of these species of the Gulf of Alaska.[42] The remainder of the resources would be allocated to foreign vessels or not be harvested. When additional markets are found for domestically caught groundfish and economic constraints are lifted, these species could be harvested at much higher levels if research needs, some of which are listed below, were met.

1. Research to support better management of the traditionally sought fish species through increased understanding of population dynamics, life history, and migration habitat utilization.

2. Economic research for the underutilized groundfishery, which could help solve labor, marketing, fishery capitilization, and other related problems. These economic constraints to full domestic entry into the fishery must be overcome if U.S. fishermen are to fully participate. Economic constraints are, perhaps, much more important than the multitude of other groundfish research needs, such as in the areas of life history, migration, stock size, and general utilization.
3. Research from the fishery and marine ecosystem viewpoints on the physical and biological conflicts inherent in the advent of Bering Sea oil and gas production and transportation. While these research needs are most important in the large overview sense of national economic and political concerns, timely and practical resolution of many ocean use conflicts are bound to arise in the next two decades, particularly between oil and gas development and biotic resources. Resolution would require a comprehensive and holistic knowledge of North Pacific and Bering Sea marine systems—both physical and biological.

The Arctic also contains millions of marine mammals, including walrus, whales, and 10 species of seal. Commercial exploitation of marine mammals in the past has put considerable pressure on the arctic ecosystem. Within 30 years of discovery, the sea cow of the western Bering Sea was annihilated; and the North Atlantic walrus and the Pacific fur seal and gray and bowhead whale populations nearly suffered the same fate. Through international cooperation, the situation has been arrested and in some instances reversed: the fur seal population has returned to a size capable of supporting a viable industry, and the gray whale population has returned to near its original size; the walrus population has greatly increased and bowhead populations are stable.

To protect all arctic mammals from suffering unacceptable reductions and possible extinction, a great deal more must be known about the ecosystem in which they function, their food habits, and their natural fluctuations in population as well as those induced by man. This is not an esoteric exercise in arctic science, but one on which depends, among other things, the pace and extent of future petroleum developments in the Arctic. A reminder of the importance of such investigations is the fact that neglect of research on bowhead whales has led to court action resulting in delays in offshore oil and gas development and embarrassing legal complications for the United States, both domestically (Native subsistence whaling) and internationally (IWC bowhead hunting quotas).

Environmental Protection

Despite urgent energy concerns, people throughout the world share a global responsibility to uphold environmental quality and improve it wherever possible. Tradeoffs may be necessary between meeting national priority needs which may cause environmental degradation on the one hand and the maintenance of relatively undisturbed natural ecosystems on the other. The best way to intelligently evaluate these tradeoffs is to possess sufficient knowledge to make informed judgments. Physical and biological change in the environment induced by natural forces (e.g., earthquakes, volcanism, storms, electromagnetic disturbances, and rapid fluctuations in specific animal populations) will go on without the intervention of human reasoning. Man-induced environmental change, however, offers the opportunity to apply logic. This is the shared responsibility of humankind; to shirk it is to violate the global ethic of environmental concern. It simply must be done, not merely given lip service and procedural attention. We have this obligation to today's world community and to future generations as well.

Much concern has been expressed about the need to protect the sensitive ecosystems, both terrestrial and marine, in the Arctic. Nowhere have the conflicting goals of development and environmental interests clashed more directly than in Alaska, which has been labelled the "nation's storehouse of energy" while at the same time is called the "nation's last wilderness." Conflicts like this most often surface as polarization occurs over such issues as the trans-Alaska oil pipeline and offshore oil leasing in the Beaufort Sea. Yet many people who have been involved in these matters over the years believe that a unique opportunity exists for protecting the arctic environment while simultaneously extracting minerals and petroleum.

Arctic biological systems can be thought of as tough since they have adapted themselves to a climate at the cold margin of tolerance for life, but because they are on this margin, they are highly sensitive to disturbances. When such disturbances take place, the links in the food chain are broken and rapidly replaced by new ones. This results in the "boom-and-bust" biological community that is often described as fragile. The description is valid for small areas and relatively short time frames, but over a wide area and longer time frame, i.e., given several decades to recover from a disruptive event, these ecosystems probably have quite strong survival powers—unless the disturbance is widespread and severe.

The northern part of Alaska is a semiaquatic environment with a large proportion of the surface covered by standing waters. These waters are poorly buffered and subject to impact by pollutants. We must be especially concerned about the extremely serious problems which other northern countries are having with the impact of acid rain on their fresh waters. Even more disturbing is the recent finding that high levels of sulphur dioxide are found throughout the Arctic in the winter. The source is apparently the industrial regions of northern Europe. When this material accumulates in the snow and enters the spring runoff, deleterious effects can be expected before long.

The potential for oil pollution in arctic seas is also of great concern. Spills of crude oil, for example, could constitute a large disturbance. Oil takes 20 to 50 times longer to degrade at 5°C than 25°C and could remain toxic even longer if spilled under sea ice. Major oil spills in arctic waters could have a devastating effect on populations of waterfowl, sea and shore birds, marine mammals, and polar bears. Many of these species regularly concentrate in large numbers in open leads in the pack ice or in lagoons and nearshore locations where they would be highly vulnerable to oil that was either spilled at or carried by currents to these areas. It is clear that there is a basic lack of knowledge of potential pollution sources, pollutant pathways, and various effects of petroleum on biota, including cumulative effects along the food chain in ice-covered waters. Little is known about the likely transport paths and rates of pollution by ice. No adequate cleanup technology exists. Other effects of petroleum development such as noise, displacement of biota, and destruction of habitat are also important. U.S. courts have made it clear that lack of consideration of these factors may be perceived as inadequacies in environmental analysis. This has led to delays and restrictions in offshore petroleum development, which may continue until legally adequate environmental information, as mandated by the Marine Mammal Protection Act, the National Environmental Policy Act, and other legislation, is available.

The foregoing discussion has emphasized problems in the physical and biological natural environment, but there is another set of disciplines with which we must be concerned. These seek understanding of the societal and cultural impacts of environmental change (both physical and biological) on indigenous peoples as well as newcomers to the North. These impacts may be economic, structural in societal terms, and biological in nature as they affect human physiological conditions. Just as there are interactive relationships between physical and biological change in the natural environment, there is also a complex web of interaction in the sphere of human activity and well-being.

Climate Change

If environmental protection in the context of industrial development transcends national boundaries, climatic change due to man's interference does so even more. The Arctic and Antarctic are sensitive indicators as well as regulators of worldwide climatic change, each having long-term temperature fluctuations considerably greater than those of the hemisphere as a whole. The large masses of ice also respond dramatically to any temperature change. Throughout geological history the poles have mostly been either frozen or unfrozen, with only brief transitional periods between. Consequently, the polar regions are not only indicators of change but also seem to function as climatic controls that can cause abrupt (in geological time) reversals of climatic conditions.

Past climatic cycles can be deduced from a variety of phenomena, including pollen records, variations in sea level, deposits of ancient windblown dust, and from cores drilled in present ice sheets. By analyzing such data it is possible to conclude that parts of the Northern Hemisphere, now hot and dry, were at one time cool and humid; that areas now desert were once covered with ice; and that the Arctic—from which continental glaciers have periodically penetrated the heart of North America, Europe, and western Siberia—formerly supported stands of temperate and subtropical vegetation. Paleoclimatic data indicate that there have been at least three major glacial epochs in the history of the world. The most recent of these, the Pleistocene, extends back over the past million years or so, a period characterized by numerous ice ages with advances and retreats of continental ice sheets in the Northern Hemisphere.

Analysis of current trends has led some scientists to speculate that a new "mini ice age" may be in the offing. Others, noting particularly man's ever-increasing energy use and the resulting additions of carbon dioxide to the atmosphere, foresee a gradual warming trend as a result of what is called the "greenhouse effect" of atmospheric modification. That change of some kind will occur is not debated. Periods of benign climate such as that of the past 8,000 to 10,000 years are unusual, having prevailed only 8% of the time during the last 700,000 years.

No matter which group of scientists proves to be correct, the rather precarious balance of world agriculture and human habitation obviously will be upset. The world's glaciers are particularly responsive to climatic change. They cover an area equal to about 10% of the Earth's surface, down from 26% during the last glacial advance. Should temperatures rise and eventually melt the ice they now contain, the water released would raise the level of the world's oceans by about 76 meters. A sustained decline in temperature on the other hand, even of only a few degrees, could trigger yet another glacial advance.

It is apparent that research must be conducted to predict these eventual climatic changes, if possible. Such research should monitor the output of pollutants, their eventual fate, and effects on the atmosphere and the ice in the Arctic. The first step in determining the latter is to monitor the extent of sea ice, snow, glaciers, and ice sheets in the Arctic and sub-Arctic and the corresponding changes in sea level and atmospheric and oceanic circulation. Such an effort would require a sophisticated system of satellite, aircraft, and surface measurements and the cooperation of at least all nations in the Northern Hemisphere, if not the world. Although such cooperation is feasible and has some precedents in such programs as the World Weather Watch in tropical regions, it is far from becoming a reality in the Arctic. U.S. policy in the Arctic must be directed toward achieving cooperation in this vital area of concern which is common to all nations on Earth.

Defense

The stategic importance of the Arctic derives in part from its central position between the North American and Eurasian continents and the fact that it contains important economic resources and military bases. The northernmost tip of Canada, for example, is closer to Murmansk on a great circle route (2,500 km) than it is to Ottawa (4,000 km). Furthermore, a future global war may be fought with missiles or spacecraft passing through the polar ionosphere, which has important properties that are highly variable and mainly governed by wide varations in the solar-terrestrial relationship. Numerous radar sites have been built along both the North American and USSR sides of the Arctic Ocean to provide early warning against aircraft and missile attack. The arctic seas are of particular interest to the Soviet Union as they provide the shortest marine routes linking the extremes of the USSR and afford the Soviet northern naval fleet and its large oceangoing fishing fleet year-round access to the North Atlantic from home ports on the Kola Peninsula.

Various jurisdictional problems in the Arctic also have strategic as well as political and economic implications. There is disagreement, for example, about the extent of coastal state jurisdiction over the arctic seas and on Norway's claim to exclusive control of the resources of Svalbard's continental shelf. Controversy also marks the effort to establish a Norwegian-Soviet continental shelf boundary in the Barents Sea, and the continental shelf boundary between Canada and Alaska has not yet been agreed upon. The possibility of arctic tanker traffic, the advent of the nuclear-powered submarine, and the massive buildup of the USSR fleet along the Barents Sea have enhanced the importance of the Arctic Ocean as transit areas, particularly to the USSR and to such an extent that some observers have begun to refer to the Arctic Ocean as a "Soviet lake." The Soviet Union's scientific effort in the Arctic Ocean and along margins exceeds the combined efforts of all the other littoral countries.

Recognition of the special problems that auroral-related phenomena of the arctic region create for military communications dawned during the Lend-Lease Program of World War II. Aircraft being transferred from the United States to the Soviet Union encountered severe communication difficulties over Alaska and its environs. It soon became evident that standard long-distance communication techniques and vehicle tracking could not be used in polar regions. Additionally, the technological advances of more recent times that have allowed both military and civilian usage of the stratosphere, upper atmosphere, and the near-Earth reaches of space beyond have generated other problems specific to operations in the polar regions. Of particular concern for military purposes are the difficulties that aurora-related phenomena create for missile tracking, the potential for confusion between natural auroral phenomena and nuclear explosions, and the potential impacts that electric fields and high-altitude winds associated with natural auroral phenomena can have upon the dispersion of materials released by explosions in the polar and high-latitude atmospheres.

These potential effects relate to the fact that polar regions are where the interaction between the Earth's magnetosphere, the ionosphere, and the neutral atmosphere is most intense, owing to the dipolar configuration of the Earth's magnetic field. At times, intense fluxes of charged particles stream into the high-latitude ionosphere to create visible auroras and severe changes in the ionosphere. Strong electric fields and intense currents accompany the precipitation of particles into the polar atmosphere.

The National Academy of Sciences recently emphasized the importance of studying these interrelated phenomena, stating, "The important closed chain of cause and effect relationships involving magnetic field-aligned currents, electric fields, the ionosphere and magnetosphere plasmas, and atmospheric winds must be understood quantitatively and self-consistently.[43]

To facilitate research, these phenomena are best observed from satellites above them, the Earth's surface below them, and from ballons and rockets travelling within the regions where they occur. The Arctic has been the principal locale for such studies over the past three decades. This work has been pursued with the support of both military and civilian agencies. Support was strong during the early post-Sputnik era but has declined dangerously in recent years.

Many defense concerns involving science and technology in the Arctic are classified. Nevertheless, there is common knowledge of much of this research and development despite the government's secrecy. In many cases such classification is doubtlessly spurious—imposing limitations on the acquisition of knowledge—nonstrategic, yet critical—for arctic activities and furtherance of scientific understanding. Such limitations decrease the potential value of research undertakings directly involved with military weapons systems and the detection of similar activities of other states. Much of it could, without any security risk, come out of the "military closet." For example, research in the transmission of sound in arctic waters conducted for submarine deployment purpose has potential application to the avoidance of conflict between offshore oil and gas development and the conservation and management of marine mammals, particularly endangered whales. The deployment of submarine detection electronics in the Bering Strait (a practice that is common knowledge to the Alaskan civilian community) also has possible application to oil and gas development and the acquisition of marine mammal knowledge. On other scientific fronts, knowledge about the subsurface structure of sea ice as measured from submarines has extremely valuable application to surface oil and LNG tanker and ice-breaker design and operation, development of shipping routes and spill cleanup technology, and positioning of offshore arctic facilities.

Aside from those areas requiring comprehension of polar atmospheric phenomena, physical oceanographic parameters of arctic water temperature and density variability, ice structure and dynamics, current movement, and sediment transport for both military and civilan purposes, there are at least two other areas of defense research, investigation, and training needed to alleviate U.S. military deficiencies in the Arctic. These are:

1. Knowledge of local ice, current, wind, and weather conditions essential to the deployment

of forces in coastal environments from the Aleutians to the high-arctic islands, Greenland, and Svalbard. Apart from a very few scientists and resource experts, local Natives, and a few units of the Alaska National Guard, Eskimo Scouts, we suspect that there is virtually no knowledge within the military sphere to conduct arctic amphibious or coastal troop activities.

2. Cold regions medicine, especially for military but also for other purposes, is woefully inadequate. The needs for preventative medicine techniques as well as treatment procedures for frostbite, hypothermia, mental disorientation, and trauma from cold and darkness are acute and are not receiving needed attention. Also, the treatment of physical impairments to the human body under cold conditions is an area of deficiency in medicine and surgery. Though it can be argued in this era of global military systems that this knowledge is of no real military significance, the trend toward geographically limited conflicts could prove disastrous to U.S. interest if the allocation of arctic resources escalated from an issue to combat. Examples of similar situations erupting into warfare are common. It may be debatable as to whether or not intimate local knowledge of arctic conditions and military medical procedures under situations of cold and darkness will ever be needed. That they could be, added to the other imperatives for the more routine development of arctic resources and the human occupancy of arctic environments, should create even more incentive to develop and act upon a set of U.S. arctic science priorities.

Human Life and Occupancy

If the Arctic is to be occupied and its resources utilized by the peoples of the North and by the world community, it is essential that an understanding of impacts upon and between individuals and groups, often possessing different value systems, be reached. Man is part of the arctic "ecosystem" and environment, which is sparsely settled by descendants of peoples who probably left central Asia thousands of years ago in pursuit of animals that followed retreating ice sheets northward. Highly inventive and adaptable, these people have developed needed technologies and adopted beneficial methods or tools from other cultures. This adaptive process will doubtless go on as long as man resides in the North. Historically, the Lapp's forebearers penetrated Scandinavia and the Kola Peninsula, and many diverse groups peopled the vast lands eastward of the Chukotskiy Peninsula. Ancestors of the Indians crossed the Bering Strait or went along the Aleutian Islands chain to North America. Eskimos were later arrivals. Ranging from Siberia to Greenland, Eskimos are close enough in language to understand one another. Today, their union is also political, and their cultural and environmental concerns have been brought into focus in two Inuit Circumpolar Conferences, at Barrow, Alaska in 1977 and at Nuuk, Greenland in 1980. All Eskimo groups except those of the Soviet Union were represented.

These diverse peoples met the Arctic's harsh environment and limited food and other resources with a common response in the use of snowshoes, clothes of reindeer or caribou skins, and similar homes, hunting techniques, and social organizations. The ingenious design of the Eskimo kayak and the toggle harpoon are examples of early technological innovation for arctic conditions. Since the time of Western contact, the Eskimo has continued to adopt new technologies which enhance his livelihood, while still maintaining distinct cultural and societal values and physiological needs.

Now the indigenous peoples of the Arctic, from Greenland across Canada to Alaska, are involved with national economics and politics through their participation in northern resource developments and land management. Nevertheless, all of these circumpolar peoples maintain cultural, societal, and, indeed, often imperative nutritional ties to the environment and its renewable biotic resources. Whenever new resource developments threaten their cultural and societal values, whether they are directly benefiting in an economic sense or not, they have thus far defended their priority values. In the past, however, whether in Noril'sk, Nome, Kiruna, or Yellowknife, industry that has brought new life to polar areas has largely bypassed indigenous arctic peoples in favor of immigrant labor. In North America this is no longer the case except in highly technical or management jobs, due in large part to Native economic and political involvement. Even here, greater participation is increasing rapidly through educational and training opportunities. While technological change has been adopted by northern peoples in many ways, e.g., in communications, home appliances, and hunting and fishing equipment, other items are either unacceptable or too costly. We see this today in the introduction of temperate-latitude housing, woefully inefficient in the North, and the imposition of unworkable and costly water and sewer systems.

The proper application of technology is, of course, important to the human condition in the Arctic. Well-insulated and -ventilated housing is basic to health, as are safe water supplies and sanitary disposal systems. There are, moreover, several health-specific problems associated with populations in northern latitudes. For example, Alaska has the nation's highest death rate due to alcoholism, accidents, and violence. Its citizens are uniquely exposed to hazards of cold injury and hypothermia, both at work and at play. Rapid sociocultural change is having major impacts not only on behavior, but also in such fields as nutrition, physical fitness, and the incidence of degenerative disorders of Western Civilization. An important exemplary area is that of dental health, with massive tooth decay linked to dietary change in children in Native communities.

Alaska also has unique problems and solutions in the delivery of health care to areas of low population density. Alaska industrial development is likely to involve very large projects in extremely difficult climates. The field of arctic industrial medicine is important to the economy of the state as well as the welfare of its citizens. Health problems and accident patterns of workers on the trans-Alaska pipeline construction project should have been carefully documented for guidance in future undertakings. This opportunity was missed entirely, despite the likelihood that this information would benefit major projects to follow. Such projects invariably depend on imported labor in arrangements favoring minimum numbers of employees working at maximum productivity. In practice, this typically results in nonadapted personnel working 84 to 100 hours per week in remarkable cold, in extended periods of darkness or daylight, wearing cumbersome clothing under hazardous conditions, and operating heavy equipment designed for temperate climates. Off-duty hours entail stresses related to family separation, sleep cycle disturbance, and confinement.

Because the number of arctic residents has been insufficient to command national priorities, the health effects of arctic environmental factors have been little studied. For example, there have been no studies of seasonal variations in the incidence of ulcer, depression, and other disorders, which appear to be real on anecodotal grounds. The importance of these problems is illustrated by an event involving the inappropriate opening of a single small valve on the trans-Alaska pipeline resulting in a fire which destroyed a pump station, reducing pipeline capacity by 20% for more than a year.

Research is proceeding in Alaska and throughout the circumpolar Arctic on such subjects as the behavioral aspects of death, cold injury and hypothermia, nutrition, health impacts of air pollution, intoxication behavior, temperature regulation, significant disease patterns, and health delivery mechanisms. Such research, however, is often done by single individuals and, in view of the prospects of increasing arctic populations, is woefully inadequate to meet needs in the immediate future. Areas of important research include the following priorties:

1. Alcoholism and behavioral disorders; implications for individual clients, their children, families, and communities
2. Cold injury and hypothermia, clinical management, domestic, recreational, and industrial risk situations and groups
3. Basic studies of environmental influences on human well-being, including thermal stress, extreme annual variation in light and darkness, and influence of longer wave electromagnetic radiation at high altitudes
4. Personal behavior and biologic health, including nutrition and physical fitness; implications for dental disease, cardiovascular, and malignant disease
5. Arctic industrial medicine; patterns of illness and accidents, biologic effects of long work hours in stressful environments; community impact on alcoholism, venereal disease, and mental health
6. Chemical hazards in Alaska; chronic exposure to arsenic in well water, carbon monoxide in polluted air, mercury in river water, and other chemical hazards[44]

These research needs, like others discussed here, are currently conducted without the benefit of any formal coordination and structure, although informal contact within the governmental, academic, and private medical health science community has been fairly impressive. Nevertheless, a more directed focus will be necessary if the health requirements of growing northern populations are to be protected and the productive capacities of man living and working under arctic conditions are to be enhanced.

In summary, the Arctic can be a "friendly" and healthy environment, but specific needs must be met, leading to an understanding of the best means of living and occupying the North, of cultural and societal values that differ from Western society, and of physiological and mental adaptation. Through such knowledge, we may bring to the Arctic new dimensions of economic prosperity to be enjoyed by peoples of good physical health and mental attitude.

The Arctic as a Scientific Research Laboratory

NATIONAL IMPORTANCE

A number of crucial issues of direct practical consequence to the nation have been identified above. Within a wider framework, more fundamental scientific problems are also of national importance, since numerous major benefits to mankind have been derived as a result of breakthroughs in the fundamental sciences. As has already become obvious in the preceding sections, the Arctic is a gigantic "natural laboratory" of surprising diversity which offers exciting research possibilities in almost every branch of science.

In examining this large-scale natural laboratory, starting in outer space above the Arctic, a number of fascinating features becomes apparent. The field lines of the magnetic field surrounding the Earth converge in the polar regimes. This means that charged particles from the sun enter the Earth's atmosphere in these regions, producing conspicuous effects such as the aurora, magnetic storms and substorms, and ionospheric disturbances which may black out radio communication.

Lower in the atmosphere, the high-velocity westerly jet stream is affected by processes of energy exchange at the Earth's surface in the Arctic—by sea ice distribution and ocean and land temperatures—and in turn affects the weather and climate of the entire hemisphere or even the whole Earth. Major centers where the weather of the Northern Hemisphere is being manufactured are the low pressure areas in the Gulf of Alaska and near Iceland. Drought in the Midwest and freezing temperatures on the East Coast have their origin in the activities of these subpolar centers.

Nowhere else is ice and snow in all its forms—sea ice, glaciers, permafrost, river and lake ice—as widespread and diverse as in the Arctic. Alaska is an ideal laboratory for studying these ice forms, from individual ice crystals under a microscope to the millions of square kilometers of sea ice as seen by a satellite. The solution of practical problems associated with avalanches, building roads and houses on permafrost, extracting petroleum from ice-covered waters, surging glaciers, icebergs threatening shipping lanes, and numerous others depend on fundamental research that can be conducted in the Alaska setting.

Unlike the Southern Hemisphere, a major ocean covers a large area around the pole in the Northern Hemisphere. This ocean is largely ice covered and exhibits a wide range of dynamic behavior of its ice and water masses. Scientific stations have drifted on the ice of the Arctic Ocean to explore its water structure, marine biota, and ocean floor. It has now become the scene of exploration of petroleum, and some of its marginal seas, such as the Bering, continue to be the sources of 10% of the world's fish catches.

Alaska is also part of the Pacific "Rim of Fire," where tectonic activity has created a unique and dangerous environment. Within its boundary, Alaska encloses a long island arc associated with a deep ocean trench, 40 active volcanoes, and heavy earthquake activity. Since from 5 to 7% of the world's potentially most devastating earthquakes occur in Alaska, this is an ideal location for the study of the earth's structure and its often violent surface movements.

The Arctic has a rich fauna and flora which has adapted itself to the harsh conditions of low temperatures and light levels for most of the year. It is the breeding ground of millions of migrating birds and migrating whales and other animals, some of them rare or endangered species. It also has large numbers of year-round residents, particularly the huge herds of walrus and seals in the ocean and caribou on land. Polar bears and Arctic foxes range widely into the most remote and inhospitable regions of the central Arctic Ocean.

Finally, man has occupied the Arctic for thousands of years and has adapted himself in a unique way to the environment. His customs and technology are of great interest to scientists, as are his problems in adapting to ever-changing outside Western influences. Archaeologists, ethnologists, anthropologists, and other social scientists find Alaska– the bridge for major migrations from Asia to North America—a fascinating area for their studies.

These brief examples illustrate the uniqueness and diversity in structure, dynamics, and behavior of the arctic region as an important part of the whole Earth. Other nations are expending great efforts in the study of the Arctic because they understand that the keys to many of our planet's present and future problems may lie in this region. If the United States is to participate in this process in any meaningful way, it must begin to involve itself in arctic research now.

SCIENTIFIC TRAINING

The intensive study of the arctic environment obviously requires a cadre of trained and experienced scientists and resource specialists. Over the span of the last few decades the demands for polar science from one year to another and the fluctuating funding levels for arctic research have prevented the creation of a body of researchers of sufficient dedication and size to adequately respond to arctic problems. Thus, whenever a problem arises, scientific teams must be created virtually from scratch, and solutions to the problems are unnecessarily delayed. Moreover, when work on a specific task is completed, the teams are allowed to disintegrate. This is not an efficient procedure. It wastes valuable training and experience and squashes professional enthusiasm.

A good example of such an occurrence was the Arctic Ice Dynamics Joint Experiment (AIDJEX), which took place in the Arctic from approximately 1970 to 1978. The experiment arose from the need to study basic and applied aspects of ice dynamics in the Arctic Ocean. AIDJEX was particularly important for developing adequate forecasting of ice conditions, which could be used in the annual Prudhoe Bay barge supply and for future tanker traffic in the Arctic. Also, AIDJEX perhaps was a response to the perceived need to close the arctic research gap with the Russians. The AIDJEX experiment was highly successful. With the sophisticated instrumentation and computer technology available to the U.S. and Canadian researchers, it made a giant stride in catching up with the Russians. However, when it was completed, funding stopped, and the scientific team was allowed to disintegrate—losing almost entirely for the United States its accumulated collective experience. A few years later, new teams had to be assembled to examine similar problems associated with the offshore industrial development of the Arctic. That the originally assembled talent could not be utilized for subsequent tasks emphasizes the absence of foresight, planning, coordination, and long-range interest by the federal government in arctic science.

A number of highly topical and important problems, both pure and applied, are not adequately addressed at present because there are no scientists available to do so, even if funds were available. When an agency in the federal government suddenly discovers the urgent need to obtain data to solve one of these problems, the inevitable and all too familiar crash program results. An example of the federal government's lack of foresight in recognizing the need for long-term research are the outer continental shelf studies of the U.S. Department of the Interior, which examine the possible effects of petroleum exploitation offshore Alaska. Lack of long-term research on bowhead whales has already led to litigation, delays, and loss of revenues and threatens additional delays and possibly severe reductions in offshore oil and gas development in the Arctic and embarrassing legal complications for the United States, both domestically and internationally (International Whaling Commission bowhead hunting quotas).

Similarly, most of the research conducted on Alaska fish resources in the Bering Sea has been done by foreign countries. The consequence is that we do not know as much as we should about the fish resources we allow other nations to exploit. In itself, the fact that one of the United States' most productive resource areas is almost entirely exploited by foreign countries shows a deplorable lack of interest by the United States in arctic and subarctic resources. There are numerous other examples of needed research which are of vital interest to the nation but which are not carried out because the United States does not encourage or support careers in arctic science.

LOGISTICS AND FACILITIES

Logistic and facilities support of arctic science must be directed by national priorities. This was the reason given by the U.S. Navy for closing its arctic research laboratory (NARL) at Pt. Barrow, Alaska. For the purposes of the Navy this seems justified, although it does not remove the need for other logistics and support facilities in the Arctic. The Navy had operated NARL since 1947. During this time the laboratory supported arctic science related to the Navy's mission as well as that of a host of civilian scientists supported by or representing other federal agencies, most prominently, the National Science Foundation, U.S. Geological Survey, and the Cold Regions Research and Engineering Laboratory (CRREL) of the U.S. Army Corps of Engineers. In the mid-1970's the Navy decided that its arctic mission no longer required the expensive ($10 million annually) maintenance of NARL. Recently, the Navy's office of naval research announced NARL's phasedown to caretaker status and its intention to seek closure of the laboratory in 1982 unless a new host agency was found prior to April 30, 1981.

Various study groups in both federal and state government and the University of Alaska have examined this situation with a view towards continuing the lab's operation under different aegis. As of this writing there is no federal agency willing to undertake future NARL management. Similarily the State of Alaska and the University of Alaska do not consider the high maintenance costs justifiable in relationship to their scientific research missions. There seems to be nearly universal agreement that the scope of arctic science has changed so dramatically in the past decade that alternate facilities and bases from the Bering Sea to the Mackenzie River delta and at Fairbanks and Anchorage, Alaska are generally more cost effective and suitable to the pursuit of scientific inquiry. A final determination of NARL's future is mandated by Sec. 1007 of the Alaska National Interest Lands Conservation Act (16 USC 3147). This section instructs the secretaries of the Departments of Interior, Defense, and Energy to initiate and carry out a study to determine the future of the laboratory within an overall context of "redirecting the United States Arctic research policy . . ." The secretaries will then make their recommendations about the future of the single laboratory devoted to U.S. arctic science.

The conduct of science in arctic seas is another story. The American oceanographic community has achieved its prestigious position largely through pioneering efforts and imaginative approaches in the temperate and tropical regions of the world's oceans. Its arctic capabilities and experience are sorely deficient. If national scientific priorities are to be reordered toward arctic interests, we must quickly develop a capability for the conduct of marine science in ice-covered seas.

Our national oceanographic fleet is notably deficient with respect to sea ice capability. U.S. Coast Guard icebreakers primarily are committed to other missions and are generally ill-suited to scientific pursuits. The need for research platforms, capable of operating in seasonal sea ice and in high latitude open oceans, is now widely appreciated within the national oceanography community. Basically, what is required is a long-term, broadly based commitment to arctic marine research in general, which would fully employ an array of new research facilities, including satellite imagery technology, long-range aircraft, submarines, drifting ice stations, and remote sensing. Most importantly, however, arctic scientific research requires economical, ice-strengthened, stable research ships, which to our national disgrace, we now lack.

FRAMEWORK FOR A U.S. ARCTIC SCIENCE COMMITMENT

A Sense of Urgency

U.S. arctic science policy must be more closely linked to national needs, primarily for extractive resources which exist in abundance in the Arctic. Most urgent is the U.S. need for oil and gas from arctic petroleum-bearing structures; second is the need for strategic and critical minerals; and third, food from fisheries. There can be no question that solutions to the "Alaska" or "arctic dilemma" of resource delivery may well be central to the economic survival of the United States in the next 20 to 50 years. The nation must face up to this reality. Already, a decade and a half have been lost due to the limitations placed on arctic science by the events surrounding National Security Council Memorandum 144 and by our increasing dependence as a nation on Middle East and other foreign energy imports. Needed now is a central and comprehensive national dedication to develop and increase the understanding of the Arctic—its people, its resources, its environmental hazards and frailties, and its ecosystem interactions. With these, a new productive future for North American society can be achieved—without it we will probably cease to be an important world society. It is that stark a reality and really that simple.

National attention on arctic problems is increasing. Many new disparate forums and programs are taking shape and substance, even while other programs decline. Certainly significant have been the recent strong resolutions of the Alaska Council on Science and Technology and the American Association for the Advancement of Science in support of strengthened and dedicated approaches to arctic science. Some major planning efforts are under way. The oil and gas industry, in partnership with the Department of Energy through the National Petroleum Council, is currently engaged in a comprehensive study designed to identify and overcome barriers to arctic oil and gas exploration, production, and delivery. In Alaska, hearings are under way before the Alaska Council on Science and Technology to identify gaps in federal programs in arctic science and technology and before the Alaska legislature to determine proper and priority roles for the State of Alaska in the conduct and support of northern science. These activities and their results will surely be communicated to the national level, but it is doubtful that they will have much effect without a national dialogue and subsequent federal commitment to develop a national arctic science policy.

Direction by Legislation

The arctic science community has been talking to itself for years. Dialogue between executive branch interagency committees and publications and reports of the National Academy of Sciences have described the problem but have resolved nothing. The only significant forum for the resolution of national needs is the Congress of the United States. Similarly, the only place to answer state needs is the Alaska legislature.

During the past 20 years or so both the Congress and the Alaska legislature have dealt with three problems specific to Alaska that are highly philosophical as well as political. These problems derive from three major forces in American history, which may now be reaching their climax in Alaska. First, the force of "westward expansion," or "manifest destiny"—the nation reaching the limits of its frontiers—came to an end with the passage of the Alaska Statehood Act in 1958. Second, national efforts to deal with the rights of the aboriginal people of North America, begun nearly 200 years ago in decisions of Chief Justice Marshall, were consummated with the 1971 passage of the Alaska Native Claims Settlement Act. Third is the force leading to the identification of unique natural resources and environments, now culminating in the dedication of Alaska lands to the national park, national wildlife refuge, national forest, national wild and scenic rivers, and national wilderness preservation systems pursuant to the Alaska National Interest Lands Conservation Act of 1980. Thus, despite the still-existing irritants and impediments of bureaucratic process in the executive branch, the ways are open in Alaska to the fulfillment of those desires and ethics represented by these three forces of economic progress, social and economic justice for Native peoples, and the conservation and preservation of unique northern natural values.

One major problem requiring national commitment for solution remains. We do not have the knowledge necessary to achieve the results towards which these political forces drive toward. Surely the Congress and the Alaska legislature, recognizing the importance of these forces, albeit with some differing views, must now agree that a political recognition of the means for achievement through scientific research and technological innovation is essential. On the international front, too, knowledge is essential to the resolution of law-of-the-sea questions and jurisdictional limitations in the Arctic basin.

Those who support economic progress and the development of resources, the enhancement of human condition, and the comprehension of natural systems in the North must again turn to the Congress for the development of a national commitment to these ends. Such an agenda in the Congress could logically take one of two basic forms. In one approach, through the hearing process, Congress could examine problems and develop appropriate legislation. Another approach involves appropriate hearings in the Congress to focus on specifically introduced legislation designed to achieve a necessary commitment to arctic science. The Alaska Division of the American Association for the Advancement of Science intends to promote one or the other of these legislative approaches in the Congress. Further, both the executive and legislative branches of the State of Alaska are expected to strongly support congressional inquiry and development of solutions.

Recognizing that state and federal legislatures provide the nation's best opportunity to deliver, discuss, and resolve the imperatives presented here, we strongly urge (1) legislation in the Alaska State Legislature that identifies and financially supports priority science programs in Alaska for Alaska and (2) legislation in Congress that identifies national scientific research needs in the Arctic and encourages the pursuit of northern knowledge necessary for natural resource development, national defense, environmental protection, climate change, basic scientific research, and the health and well-being of arctic occupants as well as mechanisms for the timely delivery of such knowledge.

Considerations for Legislation

To adequately deal with the arctic science issue legislatively, the fragmented nature of the current situation should be recognized. We understand the derivation of this fragmentation from the mission assignments of agencies in a host of statutes and executive orders. However, if the Congress recognizes the national problems and challenges set forth in this paper, then it must also realize that for the past 20 years efforts within the executive branch to advance the cause of arctic science, as a prerequisite to natural resource development, improved defense systems, environmental protection, and the enhancement of human life in the Arctic, have all failed. The history of these efforts is clear. Our arctic national objectives simply will not be met by executive branch equivocation. Problems can be identified and solutions mandated only by Congress.

To solve the problems of meeting national energy, mineral, or defense needs from resources within the arctic region, the Congress should recognize that the industry sector possesses certain technological capacities beyond those of government. Equally important is for government, and the science community more generally, to develop understandings of natural processes and the environmental and societal impacts of industrial technology. One way to achieve a directed approach towards arctic resource and defense solutions is to legislatively establish appropriate partnerships between government and industry. Examples of how to achieve such partnerships exist in other spheres of interest (e.g., communication) and in other nations (e.g., Canada). We do not outline here the exact manner of such a partnership, but we strongly advocate that it be forged.

In other areas of arctic science concern, more directed coordination between the Alaska and federal governments is desired. Here again, specific problem-solving mechanisms are possible, and we urge that they be established, particularly in the fields of environmental comprehension and protection, medicine, and health.

Finally, the problem of establishing international accords in the arctic region also requires legislative mandate. The Departments of State and Defense have both exerted their influences within a secretive vacuum which has excluded contribution from the science community, the government of Alaska and the indigenous peoples of the region. In this arena, also, it appears to us to be quite desirable that Alaska's political and societal interests as well as the arctic scientific community's contribute their knowledge to those developing U.S. policy for the Arctic. From our collective knowledge, some meaningful contribution to the state of the nation should result.

The legislative consideration of these three subjects—government-industry partnerships in resource development; general state-federal partnership in science programming; and the involvement of Alaska scientific and societal interests within arctic international affairs—will do much to further our national purposes. Whatever approaches are advanced, they will be scrutinized by diverse interests, and properly so. The challenge for the nation in arctic science is to develop the best approaches possible in recognition of the national imperatives involved. We offer this paper in hope that it will stimulate this process.

SOURCE DOCUMENTS AND NOTES

1. For the purposes of this paper, the arctic region is generally defined as that area north of 60° north latitude, including those waters of the Bering Sea and other marginal seas of the Arctic Ocean that are subject to seasonal ice cover.

2. D.M. Hickok, A historic and current view of Alaskan arctic research and events, unpublished (Anchorage: Arctic Environmental Information and Data Center, University of Alaska, 1976), 29 pp.

3. H. Pollack and P.J. Anderson, United States policy for the Arctic, Arctic Bulletin. 1(1):2.

4. By the turn of the century many major expeditions had been sent to the Far North. Some of these parties were financed by private firms, such as the 1837 Dease and Simpson party sent by the Hudson's Bay Company. Journals of whaling ships, many of which overwintered in the Arctic, revealed much about the coast of arctic Alaska and its people. The U.S. government also became involved with arctic exploration. The International Polar Expedition to Point Barrow (1881-83) reported meteorological, archaeological, and other scientific observations. Lt. George Stoney explored the Kobuk River and Brooks Range in 1883 and 1885-86. Ensign W.L. Howard traversed the Noatak and Colville river drainages in 1885. Lt. S.B. McLenegan explored the Noatak in 1887. A U.S. Geological Survey party led by Frank C. Shrader reconnoitered the Brooks Range in 1889. Brief accounts of early expeditions to the Arctic can be found in Ernest Leffingwell's document on the Canning River region.

> E. Dek. Leffingwell, The Canning River region, northern Alaska. (Washington, DC: U.S. Government Printing Office, 1919), U.S. Geological Survey Professional Paper 109. 251 pp.; Hickok (see note 2).

5. Examples of federal legislation include: federal sponsorship of the reindeer industry, beginning in 1890; the Act of May 14, 1898, extending U.S. homestead laws to Alaska and providing for waterfront tracts for Native use; the Alaska Native Allotment Act of 1906, providing homestead tracts to Natives.

> Federal Field Committee for Development Planning in Alaska, Alaska Natives and the land (Washington, D.C.: U.S. Government Printing Office, 1968), 565 pp.

6. Exploration in the area of Naval Petroleum Reserve No. 4 began in 1904; however, with its designation as a reserve in 1923,

private industry efforts toward development were halted. A major exploration program from 1944 to 1953 assessed the petroleum potential of the area. Private industry exploration in the arctic coastal plain and foothills resumed in 1963.

> U.S. Geological Survey, An environmental evaluation of potential petroleum development on the National Petroleum Reserve in Alaska (Washington, DC: U.S. Government Printing Office, 1979), 238 pp.; D.L. Morgridge and W.B. Smith, Geology and discovery of Prudhoe Bay field, eastern Arctic slope, Alaska. Memoir 16: Stratigraphic Oil and Gas Fields. American Association of Petroleum Geologists (1972). pp. 489-501.

7. The Spitsbergen (Svalbard) Archipelago Treaty (43 Stat 1892, Part 2 (1925); Treaty Series 686) was signed February 9, 1920 by representatives of the United States, Great Britain, Denmark, France, Italy, Japan, Norway, the Netherlands, and Sweden. Sovereignty of Norway over the archipelago was recognized, and all parties were given mutual liberty of access and entry to adjacent waters for fishing, hunting, maritime, industrial, mining, and commercial operations. Thus, today the continental shelf around Svalbard is available for U.S. fossil fuel exploration.

8. Stefansson made numerous trips in the Arctic. His success was in great part due to the readiness with which he learned from the Eskimos themselves, adopting survival skills enabling him to spend greater lengths of time in the Arctic than had previously been possible by using Western technology alone.

> V. Stefansson. The friendly Arctic; the story of five years in polar regions (New York: The Macmillan Co., 1921), 812 pp. (Reprinted in 1969 by Greenwood Press, New York, NY.)

9. One example of policy conflict occurred after World War II with the advent of intercontinental weapons systems and the Distant Early Warning (DEW) line in northern Alaska and Canada. There was no effort to compensate Alaska Natives displaced by governmental action, and several impingements on indigenous peoples' property and civil rights occurred.

> Federal Field Committee (see note 5); J.M. Nielson and North Slope Borough Planning Dept., Kaktovik, Alaska; an overview of relocations. Report for City of Kaktovik and North Slope Borough Commission on History and Culture (1977), 26 pp.; U.S. Eighty-sixth Congress, Ocean sciences and national security (Washington, DC:

U.S. Government Printing Office, 1960), Report of the Committee on Science and Astronautics, House Report No. 2078, 180 pp.

10. The U.S. Public Health Service was given responsibility for the health care of Alaska Natives in 1955, at which time a major tuberculosis control program was designed and implemented. The tuberculosis incidence rate in 1952 was 1,854 cases per 100,000; by 1970 this had dropped to 154 per 100,000.

M.W. Johnson, Health services reports (Washington, DC: U.S. Government Printing Office, 1973), 88(3): 247-254.

11. The U.S. Geological Survey began studies of the petroleum potential of northern Alaska in 1944. From 1945 to 1953 the survey and the navy together explored NPR-4 and adjacent areas. George Gryc was responsible for much of the geological investigations in the Sagavanirktok and Canning-Shaviovik River areas, leading to the eventual discovery of the Prudhoe Bay oil field. The Prudhoe Bay discovery well, ARCO-Humble No. 1, was completed in June 1968.

J.C. Reed, Exploration of Naval Petroleum Reserve No. 4 and adjacent areas, northern Alaska, 1944-53; Part 1. History of the exploration (Washington, DC: U.S. Government Printing Office, 1958), U.S. Geological Survey Professional Paper 301. 192 pp.; F.K. Rickwood, The Prudhoe Bay field (Proceedings of the Geological Seminar on the North Slope of Alaska, American Association of Petroleum Geologists, Pacific Section, Palo Alto, California, 1970); Morgridge and Smith (see note 6).

12. NARL was established in 1947 by the Office of Naval Research. Several contractors operated the facility and the University of Alaska served in this function since 1954. The laboratory provided logistical support for transient scientists working on a broad range of both applied and basic research programs. The Arctic Health Research Center, located in Anchorage, was first funded in 1948. Its activities included grants adminstration for special health needs and provision of technical assistance to the Alaska State Health Dept. as well as research. Studies covered animal-borne diseases, biochemistry and nutrition, entomology, environmental sanitation, and physiology.

J.C. Reed. The story of the Naval Arctic Research Laboratory, 1969. Arctic. 22(3):177-183; T. Parran, et al., Alaska's health: a survey report (Pittsburgh, PA: University of Pittsburgh, Graduate School of Public Health, 1954), Report of the Alaska Health Survey Team.

13. The International Geophysical Year gave considerable impetus to these studies and the University of Alaska's Geophysical Institute achieved worldwide recognition for expertise in these fields.

14. Fletcher's Ice Island (T-3), a large stable ice floe in the Arctic basin, was occupied nearly continuously from 1952 to 1975 by scientists concerned with oceanography, marine geophysical and biology, climatology, and arctic air-sea interactions and effects on global climate. During that period it made three circumnavigations of the Arctic basin.

15. By the mid-1960's, two areas of Congressional concern were rapidly developing which would have great impact upon arctic science. These were environmental protection and rehabilitation and national ocean policy. A series of laws, which gave support and urgency to ecological investigation and research and to the reorganization of ocean programs in government, resulted.

16. Commission on Marine Science, Engineering and Resources, Our nation and the sea, a plan for national action (Washington, DC: U.S. Government Printing Office, 1969), Report of a Congressional Commission.

> G.A. Doumani, Exploiting the resources of the seabed (Washington, DC: U.S. Government Printing Office, 1971), Report for the Committee on Foreign Affairs, U.S. House of Representatives. 152 pp.; President's Science Advisory Committee, Effective use of the sea. (Washington, DC: U.S. Government Printing Office, 1966), Report of the Panel on Oceanography. 144 pp.

17. The discovery of oil at Prudhoe Bay, Alaska identified oil and gas deposits with proven reserves estimated to be 9.6 billion barrels of oil and 26.5 trillion cubic feet of gas. Construction for the field's development required new technologies in well drilling and facilites construction to deal with permafrost and climatic conditions.

> U.S. Geological Survey (see note 6).

18. The Federal Field Committee for Development Planning in Alaska was created to help guide federal efforts during postearthquake recovery from the devastating 1964 earthquake. It was a unique body, composed of the heads of federal agencies in Alaska and chaired by presidential appointee Joseph Fitzgerald, who reported directly to the cabinet of the president. Although the committee involved itself in some program matters, its essential forte was in securing federal policy considerations at high levels in govern-

ment, both in the executive branch and in the Congress. The committee quickly identified several subjects which required resolution if there was to be long-term economic recovery and growth in Alaska. One of these was the need for the United States government to set forth a policy position on national interests in the entire circumpolar Arctic. Other major policy positions involved change in Alaska's communication and transportation systems, the resolution of aboriginal land claims, and improvements in Native housing, minority hire, and the health of indigenous peoples.

19. The antarctic science program is essentially a function of U.S. foreign policy as set forth between nations in the Antarctic Treaty.

20. G. Doumani, A report of federal arctic research (Washington, DC: U.S. Government Printing Office, 1967) a report for the committee on appropriations, U.S. Senate, 90th Congress, Senate Document No. 71. 313 pp.

21. The text of the executive order dissolving the IARCC follows:

EXECUTIVE OFFICE OF THE PRESIDENT
FEDERAL COORDINATING COUNCIL FOR SCIENCE,
ENGINEERING, AND TECHNOLOGY
WASHINGTON, D.C. 20500

June 30, 1978

Dr. Edward P. Todd
Director, Division of Polar Programs
Directorate for Astronomic, Atmospheric,
Earth, and Ocean Sciences
National Science Foundation
1800 G Street, N.W.
Washington, D.C. 20550

Dr. Ed:

The purpose of this letter is to advise you of the formal dissolution of the Interagency Arctic Research Coordinating Committee (IARCC).

This step is being taken in accordance with the President's Reorganization Plan No. 1, effective October 18, 1977, as implemented by Executive Order 12039, effective February 26, 1978. The intent of this plan with regard to FCCSET is to strengthen its role by reconstituting the Council as a sub-Cabinet level working group, chaired by the President's Science and Technology Adviser. As such, it will focus its attention on significant, national, scientific, and technological issues cutting across government departments and agencies.

Over the past several months, my staff and I have reviewed the structure and function of FCCSET and assessed the continuing need for its various committees. As a result, we have formulated a plan whereby the functions and responsibilities of existing committees are either combined and assigned to a much smaller number of FCCSET committees, or reassigned to lead agencies. In the latter case, the lead agencies will coordinate research and development in the assigned area and periodically report to me on the status of those R&D activities. This concept is in accord with the President's desire to emphasize Cabinet and agency program management where possible.

In the case of IARCC, we believe that the need for inter-agency coordination is sufficiently understood, and the usefulness of the existing Committee sufficiently recognized, that its functions can now be carried out at the agency level. Accordingly, the Department of the Interior is coordinating polar research in Alaska and on the continental shelf, and NOAA is coordinating offshore and Gulf of Alaska research. We hope that you will take the lead in assessing the future need for additional coordination in the area of Arctic research and in establishing appropriate mechanisms for achieving that coordination.

I will greatly appreciate your apprising Committee members of this action and expressing to them the President's appreciation for their valuable work.

Yours sincerely,

Frank Press
Chairman

22. U.S. Geological Survey (see note 6).

23. Federal Field Committee for Development Planning in Alaska (see note 5).

24. The final result of a lengthy process of environmental examination and hearings was:

> U.S. Dept. of the Interior, Special Interagency Task Force, Final environmental impact statement; proposed Trans-Alaska

pipeline (Washington, DC: U.S. Government Printing Office, 1972), Report for the Federal Task Force on Alaskan Oil Development. 6 vols.

25. University of Alaska, Arctic Environmental Information and Data Center. Current research profile for Alaska (1979), 420 pp.

26. National Council on Marine Resources and Engineering Development, Marine sciences affairs—a year of broadened participation (Washington, DC: U.S. Government Printing Office, 1969), Report for the U.S. Congress, 251 pp.

27. Following is the full text of National Security Decision Memorandum 144.

December 22, 1971

TO:
The Secretary of State
The Secretary of Defense
The Secretary of Interior
The Secretary of Commerce
The Secretary of Transportation
The Director, National Science Foundation
The Chairman, Council on Environmental Quality

SUBJECT: United States Arctic Policy and Arctic Policy Group

The President has reviewed the NSC Under Secretaries Committee's recommendations, conclusions and report regarding United States Arctic policy and organizational arrangements for its implementation, as forwarded by Under Secretary Irwin on August 9, 1971.

The President has decided that the United States will support the sound and rational development of the Arctic, guided by the principle of minimizing any adverse effects to the environment; will promote mutually beneficial international cooperation in the Arctic; and will at the same time provide for the protection of essential security interests in the Arctic, including preservation of the principle of freedom of the seas and superjacent airspace.

In furtherance of this policy, the President has:

- Directed that the NSC Under Secretaries Committee review and forward detailed action programs, including plans and specific projects (with budgetary implications as appropriate), for increasing mutually beneficial cooperation with Arctic and other countries in areas such as exploration, scientific research, resource development and the exchange of scientific and technical data; for improving the U.S. capability to inhabit and operate in the Arctic and the understanding of the Arctic environment; and for developing a framework for international cooperation with particular attention given the Northlands Compact approach. (These action programs should be forwarded for the President's consideration not later than March 1, 1972.)

- Directed that an Interagency Arctic Policy Group be established, chaired by the Department of State and including the Departments of Defense, Interior, Commerce and Transportation, the National Science Foundation, the Council on Environmental Quality and representatives of other agencies as appropriate. (The Department of State is responsible for providing the administrative support, including staff, necessary to enable the Arctic Policy Group to carry out its responsibilities.) The interagency Arctic Policy Group will be responsible for overseeing the implementation of U.S. Arctic policy and reviewing and coordinating U.S. activities and programs in the Arctic, with the exception of purely domestic Arctic-related matters internal to Alaska. In discharging these responsibilities, the Arctic Policy Group will report to and coordinate with the NSC Under Secretaries Committee. Any substantive policy issues requiring the President's decision will be referred to the NSC Senior Review Group for consideration.

- Approved the development of a coordinated plan for scientific research in and on the Arctic, including possible cooperative projects with Arctic and other countries, and the investigation of the feasibility of developing a comprehensive transportation system capable of meeting U.S. requirements in the Arctic, with appropriate recommendations to be made to the Arctic Policy Group.

There should be no public statements concerning U.S. Arctic policy and the other decisions set forth herein pending the President's review of the action programs requested above.

Henry A. Kissinger

cc: Secretary, Health Education and Welfare
Director of Central Intelligence
Administrator, Environmental Protection Agency
Chairman, Joint Chiefs of Staff
Director, Office of Management and Budget
President's Science Advisor

28. Two editions of this report, *Five-Year Plan for Arctic Research* were prepared by the Interagency Arctic Research Coordinating Committee, and published by the National Science Foundation. The first in February 1972 and a revised edition in November 1972.

29. National Research Council, Ad Hoc Planning Group for the Committee on Arctic Science and Technology, Summary report (1973), Vol. 1.

30. See the following:

C. Abrams, Housing the Alaska Native (Anchorage: Alaska State Housing Authority, 1967), 74 pp.; A.J. Fuelner, Summary of water supplies of Alaska communities (Anchorage: Resource Planning Team, Joint Federal-State Land Use Planning Commission, 1973). 6 vols.; A.J. Alter, Solid waste management in cold regions. (College: Alaska Water Laboratory, 1979), Alaska Dept. of Health and Welfare Scientific Research Data and Reports, Vol. 2, No. 2.

31. The Marine Mammal Protection Act of 1972 preempted any state authority over marine mammals and replaced it with a single federal program. The act created the Marine Mammal Commission, functioning as an advisory body to the Secretaries of Commerce and the Interior, charged the commission with conducting a continuing review and study of all stocks of marine mammals and of all U.S. activities relating to them.

Through the Endangered Species Preservation Act of 1966, the Endangered Species Conservation Act of 1969, and the Endangered

Species Act of 1973, the Secretary of the Interior was given responsibility for the conservation and protection of species "threatened with worldwide extinction." This included the development of a list of endangered species. The 1972 act authorized a more comprehensive program which incorporated the idea that populations could be recognized as seriously depleted before being eligible for endangered species status. Thus, the "threatened" category came into play.

See:

> National Environmental Policy Act, 42 U.S.C. Sec. 4321-47 (1970): Marine Mammal Protection Act, 16 U.S.C. Sec. 1361-62, 1371-84, and 1401-97 (Supp. IV 1974) as amended by Fisheries Conservation and Management Act of 1976, Pub. L. No. 94-265, Sec. 404, 90 Stat. 331; Endangered Species Act of 1973, 16 U.S.C. Sec. 1531-43 (Supp. IV 1974) as amended by Pub. L. No. 94-359, 90 Stat. 913; Stat. 275; Endangered Species Preservation Act of 1966, Pub. L. No. 89-669, Sec. 1-3, 80 Stat. 926.

32. An impressive list of publications of the Tundra Biome Program includes:

> J. Brown, ed., Ecological investigations of the tundra biome in the Prudhoe Bay region, Alaska (Fairbanks: Biological Papers of the University of Alaska, 1975), Special Report No. 2, 215 pp.; F.S. Chapin, III and K. Van Cleve, Nitrogen and phosphorus distribution in an Alaskan tussock tundra ecosystem: Natural patterns and implications for development (Environmental chemistry and cycling processes: Proceedings of symposium, Augusta, Georgia, 28 April-1 May 1976), U.S. Department of Energy, CONF-760429. pp. 738-753; J.E. Hobbie, ed. Limnology of tundra ponds, Barrow, Alaska (Stroudsburg, PA: Dowden, Hutchinson & Ross, Inc., 1980), 514 pp.; L.L. Tieszen, ed. Vegetation and production ecology of an Alaskan arctic tundra (New York, NY: Springer-Verlag, 1978), 686 pp.; J. Brown, et al., eds. An arctic ecosystem: the coastal tundra at Barrow, Alaska (Stroudsburg, PA: Dowden, Hutchinson & Ross, Inc., 1980), US/IBP Synthesis Series 12, 571 pp.

33. A series of reports on this project were published in the AIDJEX Bulletin; (40 issues 1970-1978) and a final synopsis volume, Sea ice processes and models.

34. See the Arctic Offshore Program (AOP) "A research program focused on the development of the natural resources of the arctic continental shelves," National Science Foundation, Office of Polar Programs, Washington, DC.

35. Exceptions were the Tundra Biome and Arctic Ice Dynamics Joint Experiment and more recently, although as yet uncompleted, the PROBES program (Processes and Resources of the Bering Sea Shelf).

36. Abstracts of a paper prepared for the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, (Spitsbergen Seminars), Trondheim, Norway, August 1979.

37. U.S. Central Intelligence Agency, "The world oil market in the years ahead," National Foreign Assessment Center, ER 79-10327U, Aug. 1979, p.2.

38. Comptroller General of the United States, *Oil and natural gas from Alaska, Canada and Mexico—only limited help for U.S.*, Report to Congress, U.S. General Accounting Office, EMD-80-72, Sept. 11, 1980, p.2.

39. See Environmental Assessment of the Alaska Continental Shelf, Interim Synthesis: Beaufort/Chukchi (National Oceanic and Atmospheric Administration, August 1978) for a discussion of sea ice and other hazards as seen by university, government, and oil industry scientists and engineers (pp. 335-355). Comptroller General of the United States (see note 37).

40. The U.S. government defines strategic and critical metals as those needed for defense for which there are no reliable substitutes and those upon which the United States has more than a 25% net import reliance. Although copper and lead are not listed as critical, their industrial importance is great, and copper especially is critical to the economic importance of several Alaskan deposits.

41. Alaska's foremost geologists believe that this nickel deposit may well be Alaska's most important prospect to allay strategic mineral shortages for the United States. Certainly, straightforward analysis of the value of the development of this prospect against the values of national monument preservation deserves attention.

42. North Pacific Fisheries Management Council, Fishery management plan for groundfish in the Gulf of Alaska (Anchorage, 1979).

43. Reports of the Study Committee and Advocacy Panels, Space Science Board, National Research Council, Space plasma physics: the study of solar system plasmas (Washington DC: National Academy of Sciences, 1978), Vol. I.

44. W.W. Myers, Health research in Alaska, a proposal by WAMI Medical Education Program, Universtiy of Alaska, Fairbanks, unpublished.

BEST COPY AVAILABLE

BY THE COMPTROLLER GENERAL

Report To The Congress

OF THE UNITED STATES

Developing Alaska's Energy Resources: Actions Needed To Stimulate Research And Improve Wetlands Permit Processing

SUMMARY

Additional research is needed to evaluate the impacts of oil and gas-related activity in Alaska as a basis for promoting environmentally sound approaches to future development without unnecessarily increasing its cost. Such efforts should provide site-specific data to allow the tailoring of protection measures suitable for the areas to which they are applied, and to minimize universal or blanket stipulations where they are not necessa[illegible]

The Corps of Engineers has been sl[illegible] proc[illegible]essing wetlands permits, required [illegible] oil and gas projects in Al[illegible] and [illegible]quently included contro[illegible] co[illegible]ditions--such as seaso[illegible] wa[illegible] disposal restrictions--in [illegible] without requiring substan[illegible]ion o[illegible]ed [illegible]ough research [illegible] site-[illegible] data.

Congress [illegible] three critical elements--coordination, prioritization, and a source of funding--when considering legislation to establish an Arctic research policy, and Federal and State agencies should use research findings and site-specific data to the maximum extent possible in support of permit stipulations.

UNITED STATES GENERAL ACCOUNTING OFFICE

GAO/EMD-82-44
JUNE 17, 1982

BEST COPY AVAILABLE

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

DEVELOPING ALASKA'S ENERGY RESOURCES: ACTIONS NEEDED TO STIMULATE RESEARCH AND IMPROVE WETLANDS PERMIT PROCESSING

DIGEST

Alaska's Federal lands are rich in energy, wildlife, and scenic resources. Energy exploration and development in this unique environment has given rise to elaborate, costly, and sometimes controversial measures designed to minimize negative impact.

To determine if Federal agencies are advancing environmentally sound approaches to energy exploration and development, without unnecessarily increasing energy costs, GAO

--analyzed the results of oil and gas-related experience on the Kenai National Wildlife Refuge, the only Federal land in Alaska where significant production has occurred (see p. 5);

--evaluated measures used in Alaska prohibiting exploratory drilling during certain months of the year (see p. 15) and controlling drilling waste disposal (see p. 20);

--evaluated the adequacy of research to lessen the impacts of energy development (see p. 22); and

--evaluated wetlands permitting, which is of crucial importance to energy development on all Alaskan lands (see p. 27).

NEED FOR ENVIRONMENTAL IMPACT RESEARCH AND SITE-SPECIFIC KNOWLEDGE FOR EFFECTIVE REGULATION OF ENERGY DEVELOPMENT

Additional research is needed to evaluate the effect energy exploration and development has had on Alaskan Federal lands. Increased site-specific research and knowledge are necessary to assure that cost-effective and environmentally sound impact mitigation techniques are utilized, as demonstrated with the management of oil and gas activities on the Kenai National Wildlife Refuge. The research itself is costly, however, and should be planned and coordinated with existing efforts.

GAO found that two costly and controversial restrictions were being widely applied to energy exploration in the Arctic. Currently, offshore oil and gas drilling is only allowed during five months of the winter with little flexibility for start and completion dates. The seasonal drilling restriction, while initially developed for offshore drilling, is now being applied to onshore activities. The second restriction requires the disposal of drilling waste in impermeable pits, even though some Government and industry officials believe it may not always be necessary. GAO found that inadequate research exists to support either the imposition or removal of these restrictions.

Site-specific research findings would allow refinement of environmental protection controls suitable to the unique characteristics of the lands to which they are applied. Gathering of site-specific data to allow application on a case-by-case basis, followed by impact-related research to further refine controlling stipulations, could allow energy exploration to proceed on a more timely and less costly basis. Research should also facilitate opening lands to exploration, enhance production possibilities, and increase expected Federal revenues.

GAO's findings are particularly pertinent to the Congress in its consideration of recently proposed legislation with regard to Arctic research. S.1562, would prioritize, fund (using a small portion of revenues from leasing Federal lands on the North Slope--both offshore and onshore), and coordinate Arctic research. Thus, it could help fill the research gaps identified in this and previous reports--but any research funded by the Federal Government should be subject to the budget process. (See pp. 24-26.)

BEST COPY AVAILABLE

WETLANDS PERMITS: DELAYS AND CONTROVERSIAL STIPULATIONS

Wetlands permits are required for many Alaska oil and gas projects. Consequently, the permit issuing agency--the U.S. Army Corps of Engineers--has become of primary importance to Alaskan energy development. Costs of this development have increased because the Corps has been late in meeting goals established for processing wetlands permits. For example, of the 167 permits GAO reviewed, 127 were late when compared to the Clean Water Act issuance goal of 105 days. The average issuance time for fiscal year 1981 permits was 152 days.

Delayed public notices and automatic extensions to agency comment periods caused significant portions of permit processing delays. The Corps' Alaska District has not, on the average, issued public notices within the 15-day period specified by law. Delays also occurred because of extensions to the 30-day public comment period. About 51 percent of the permits reviewed involved comment period extensions, most of them requested by the State of Alaska.

In addition, the Corps imposes controversial and costly permit conditions without assuring that these conditions are, in fact, needed. The need for these conditions, which are frequently proposed by various Federal and State agencies, is not substantiated by site-specific data and research findings. Seasonal drilling, waste disposal, and pipeline height requirements are among those imposed without specific substantiation. (See pp. 27-33.)

RECOMMENDATIONS

To promote environmentally sound and cost-effective approaches to exploration and development activities in Alaska, GAO recommends the following:

--In its consideration of S. 1562 and other related proposals, the Congress should provide for three critical elements: coordination, prioritization, and a source of funding for research evaluating the impacts of energy development in the Arctic. Conceivably, a small portion of the revenues derived from Federal leasing of offshore and onshore lands on the North Slope could be set aside in a special trust fund for that purpose. Appropriate congressional controls could be maintained by requiring disclosure of planned expenditures as part of the budget process. (See p. 36.)

--The Secretary of the Interior should utilize existing research findings and site-specific data to the maximum extent possible and--after a source of further funding is worked out--direct and use additional site-specific research in the application of stipulations to future Alaskan energy projects. This should include using such data as a basis for determining whether the seasonal drilling restriction should be continued as a general stipulation for individual tracts.

In addition, to expedite the issuance of wetlands permits, the Secretary of the Army should

--grant extensions for public comments to the State of Alaska only when they are adequately justified and use research findings and site-specific data to the maximum extent possible in determining the need for proposed stipulations in future permits,

--require that Federal agencies support the need for proposed permit stipulations to the maximum extent possible with site-specific data and relevant research findings, and

--direct the Chief, Corps of Engineers, to have the Corps' Alaska district management periodically summarize the time required to issue public notices and enforce the 15-day time frame established by law. (See p. 36.)

AGENCY COMMENTS

Comments on a draft of this report were received from the Department of the Army (app. I) and the Department of the Interior (app. II).

The Assistant Secretary of the Army for Civil Works expressed general support for recommendations addressing permit delays and the need for permit stipulations to be justified, and indicated that improvements in the area can be accomplished through issuance of appropriate policy guidance to the Corps. More detailed comments are addressed in chapter 5.

Interior agrees that there is a need for more studies to determine long-term effects of energy development in Alaska and for more site-specific research, but it takes exception to numerous portions of the report. The nature of these comments indicates a substantial misinterpretation of various report segments. Important areas of exception are summarized below.

--Interior states that the report ignores research pertinent to the issues discussed. In fact, the report considered ongoing research efforts, including those specified by Interior, in concluding that more effort is needed. GAO's conclusions are fortified by findings of scientific groups and by a foremost consultant in this field. Interior itself agrees that more research is needed.

--Interior disagrees that costly permit conditions are imposed without substantial evidence that they are necessary. Yet, GAO found no supporting justification for stipulations imposed in 45 of the 111 wetlands permits reviewed. The permit issuing agency, the Corps of Engineers, agrees such justification is needed.

--Interior states that the report fails to credit efforts to tailor stipulations to site-specific requirements and provide field staffs with authority to modify stipulations as appropriate. In fact, the report recognizes that Interior did this on the Kenai Refuge, and concludes that these elements will be desirable for future Alaskan energy projects.

Because of the length and nature of Interior's comments, a full text of those comments, annotated with GAO's responses, has been provided in app. II.

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ABBREVIATIONS

ACMP	Alaska Coastal Management Plan
AEIDC	Arctic Environmental Information and Data Center
ARL	Arctic Research Laboratory
BLM	Bureau of Land Management
Corps	United States Army Corps of Engineers
DOD	Department of Defense
EPA	Environmental Protection Agency
FWPCA	Federal Water Pollution Control Act
FWS	Fish and Wildlife Service
GAO	General Accounting Office

NARL	National Arctic Research Laboratory
NOAA	National Oceanic and Atmospheric Administration
NPRA	National Petroleum Reserve--Alaska
NSF	National Science Foundation
O&M	Operating and Maintenance
OCS	Outer Continental Shelf
USGS	United States Geological Survey

A COMPILATION AND DESCRIPTION OF INDUSTRY RESEARCH PROJECTS IN ALASKA FRONTIER OCS AREAS

INTRODUCTION

The Alaska Oil and Gas Association (AOGA) is a trade association whose members account for the bulk of oil and gas exploration, production and transportation activities in Alaska. AOGA is a division of the Western Oil and Gas Association.

The Lease-Sale Planning and Research Committee (LPRC) is a Special Committee of AOGA, having the responsibility of carrying out the objectives of the Association as they relate to prelease sale activities, including, but not limited to, the conduct of studies and/or investigations on matters affecting Alaska petroleum operations.

This compilation is prepared by the Technical Subcommittee of the Lease-Sale Planning and Research Committee of the Alaska Oil and Gas Association for the information of the Association's members and the general public. It contains brief descriptions of projects undertaken by industry. The majority of the listed projects were undertaken by LPRC members individually or under contracts pursuant to Article V, Section 5 of the LPRC Charter.

PROJECT AND TITLE

Project No. 1.—Bristol Bay environmental report.
Project No. 2.—Sea ice investigations, Beaufort Sea.
Project No. 3.—Chukchi Sea—Arctic Coast environmental and ecological data.
Project No. 4.—Chukchi Sea environmental study.
Project No. 5.—Beaufort Sea environmental study.
Project No. 6.—Beaufort Sea reconnaissance.
Project No. 7.—Beaufort Sea ice scouring.
Project No. 8.—North and South Bering sea environmental study.
Project No. 9.—Western Alaska (onshore) environmental study.
Project No. 10.—Arctic marine terminal facilities, Chukchi Sea.
Project No. 11.—Offshore oil terminal structure facilities in the Chukchi Sea.
Project No. 12.—Sea ice activity and pressure ridge growth in the Beaufort Sea.
Project No. 13.—Beaufort Sea environmental study.
Project No. 14.—Study of behavior of oil spills in the Arctic.
Project No. 15.—Manhattan voyage study.
Project No. 16.—Arctic tanker design study.
Project No. 17.—Over flights: Nome to Resolute.
Project No. 18.—Offshore pipelaying on the Alaskan North Slope—feasibility study.
Project No. 19.—Characteristics and distribution of nearshore permafrost, Beaufort Sea.
Project No. 20.—Sea ice dynamics and properties, Beaufort Sea.
Project No. 21.—Arctic oil biodegradation.
Project No. 22.—Investigation of ice forces on cylinder and conical offshore structures.
Project No. 23.—Artificial ice island feasibility study.
Project No. 24.—Analysis of Arctic Ocean under ice profiles, Beaufort Sea.
Project No. 25.—Bering and Chukchi Seas—Feasibility study of production operations and marine crude transportation during ice covered periods.
Project No. 26.—Beaufort Sea ice statistics from satellite (ERTS-1 data).
Project No. 27.—Ice movement study for winter, 1975–76 Beaufort Sea.
Project No. 28.—Aerial reconnaissance, 1974–75—Prudhoe Bay—Harrison, Point Lay and Kotzebue Sound and Ice Movement, Prudhoe Bay and Harrison Bay.
Project No. 29.—Bering/Chukchi Seas sea ice statistics from satellite data.
Project No. 30.—Unmanned subsea work vehicle study.
Project No. 31.—Crushing pressure of ice.
Project No. 32.—Triaxial ice measurements (fresh water ice).
Project No. 33.—Arctic Ice Islands.
Project No. 34.—Feasibility of constructing artificial gravel islands, Beaufort Sea.
Project No. 35.—Summer sea ice conditions, North Alaskan Coast.
Project No. 36.—Artificial ice island, Beaufort Sea.
Project No. 37.—St. George Basin sea ice statistics from satellite.
Project No. 38.—Saline ice triaxial tests.
Project No. 39.—Beaufort Sea ice movement study, 1976–77.
Project No. 40.—Developing ice ridging statistics in the Bering and Chukchi Seas from submarine under-ice profile data.
Project No. 41.—Oil spill response in the nearshore Beaufort Sea.

Project No. 42.—Beaufort Sea ice movement study, 1977-78.

Project No. 43.—Aerial mapping of 1978 sea ice in Norton Sound and Northern Bering Sea.

Project No. 44.—Beaufort Sea wind, wave, currents.

Project No. 45.—Arctic mobile drilling structure.

Project No. 46.—Study of methods and costs of offshore pipeline installation and trenching in the Beaufort Sea.

Project No. 47.—Yukon Delta rubble pile investigation 1978.

Project No. 48.—Beaufort Sea floor geophysical study.

Project No. 49.—Ice Island experiment.

Project No. 50.—Offshore Alaska seismic exposure study (OASES).

Project No. 51.—Aerial mapping of of 1979 Sea Ice in the Norton Sound and Northern Bering Sea.

Project No. 52.—Beaufort Sea ice movement study 1978-79.

Project No. 53.—Beaufort Sea ice movement studies 3-year summary and analysis.

Project No. 54.—Norton Sound and Northern Bering Sea rubble pile investigation 1978-79.

Project No. 55.—Beaufort Sea first-year ice survey.

Project No. 56.—Bering Sea phase I oceanographic study.

Project No. 57.—Reindeer Island, Ice Island and bridge studies.

Project No. 58.—Arctic skimmer final design project phase I. Arctic skimmer design phase II.

Project No. 59.—Arctic dispersant study.

Project No. 60.—Air cushion platform capabilities for oilspill cleanup in the Alaskan Beaufort Sea.

Project No. 61.—Conical structure test program.

Project No. 62.—Under-ice rig noise-measurement program.

Project No. 63.—Beaufort wind, wave, current hindcast.

Project No. 64.—Bering Sea aerial photography data—1977.

Project No. 65.—Beaufort Sea drilling effluent disposl study.

Project No. 66.—GOAOC project—Yakutat wave data.

Project No. 67.—GOAOC project—Group oceanographic survey—Gulf of Alaska.

Project No. 68.—GOAOC project—Weather forecast trial.

Project No. 69.—GOAOC project—1973 soil boring program.

Project No. 70.—Intentionally omitted—duplication of No. 80.

Project No. 71.—GOAOC project—ARCO cost well.

Project No. 72.—GOAOC project—Lab dynamic soil analysis.

Project No. 73.—GOAOC project—Oil-spill trajectory (two reports).

Project No. 74.—GOAOC project—Socioeconomic impact of drilling and production.

Project No. 75.—GOAOC project—Sea and subsea floor properties.

Project No. 76.—GOAOC project—Seismic risk analysis for the Gulf of Alaska.

Project No. 77.—GOAOC project—Superstructure icing.

Project No. 78.—GOAOC project—1974 Ocean current measurement program.

Project No. 79.—GOAOC project—Gulf of Alaska hindcast evaluation (WHEP).

Project No. 80.—GOAOC project—Earthquake soil response analysis.

Project No. 81.—GOAOC project—Gulf of Alaska meteorological and oceanographic forecasting program (MOFP).

Project No. 82.—GOAOC project—Gulf of Alaska wave and wind measurement program (GAWWMP).

Project No. 83.—GOAOC project—Seismic risk analysis for the Gulf of Alaska.

Project No. 84.—GOAOC project—Gulf of Alaska wave hindcasting pilot study (GAPS).

Project No. 85.—ASOC project—Bering Sea—St. George Basin/Western Bristol Bay wave and wind measurement program (BOMP).

Project No. 86.—ASOC project—Bering Sea oceanographic measurement program 1977-78 (extension of 1976-1977 BOMP).

Project No. 87.—Yakutat wave data.

Project No. 88.—Kodiak COST well.

Project No. 89.—Kodiak Shelf geotechnical soil boring and sampling program.

Project No. 90.—St. George Basin COST well.

Project No. 91.—Marathon satellite current study.

Project No. 92.—Kodiak Shelf geotechnical study.

Project No. 93.—Gulf of Alaska ground response analysis—phase I.

Project No. 94.—Beaufort Sea breakup ice movement study—1979.

Project No. 95.—1974-1975 Beaufort aerial reconnaissance study.

Project No. 96.—Model tests and analysis of multiyear pressure ridges failing against a 45 degree cone.

Project No. 97.—Sonar ice mapping system (SIMS)—The development and the 1977–78 measurement program.

Project No. 98.—Feasibility study of an air cushion drilling system for shallow water areas of the North Slope of Alaska.

Project No. 99.—Yukon Delta tide gauge program—1979.

Project No. 100.—Beaufort Sea geotechnical interpretation, supplemental study.

Project No. 101.—Norton Sound geotechnical interpretation study.

Project No. 102.—Beaufort Sea freeze-up movement study—1979.

Project No. 103.—OSI Stress Sensor Study.

Project No. 104.—OSI Beaufort Sea oceanographic measurement program, 1979.

Project No. 105.—Seismicity of offshore Alaska regions (SOAR) program.

Project No. 106.—Arctic cone test structure—phase 1.

Project No. 107.—Large-scale and small-scale ice strength measurement.

Project No. 108.—1979–80 Beaufort Sea ice movement study.

Project No. 109.—Level ice and pressure ridge characteristics during USCGC *Polar Star* deployment in Bering and Chukchi Seas.

Project No. 110.—Bering Sea ice aerial mapping—1980.

Project No. 111.—Aerial mapping of sea ice in the Chukchi Sea, 1980.

Project No. 112.—Bering Sea ice features.

Project No. 113.—Conical structure test program, 1979–80.

Project No. 114.—Ice stress sensor verification.

Project No. 115.—Geotechnical considerations of St. George Basin, offshore Alaska.

Project No. 116.—Bowhead whale study.

Project No. 117.—Sea ice conditions along North Slope, Cape Halkett to Flaxman Island.

Project No. 118.—Beaufort Sea breakup study—1980.

Project No. 119.—Beaufort Sea oceanographic measurement program, 1980.

Project No. 120.—Acquisition and interpretation of SLAR ice imagery in the Prudhoe Bay area.

Project No. 121.—Preliminary design of an Arctic cone test structure with indirect load measurement.

Project No. 122.—Offshore Alaska seismic measurement program.

Project No. 123.—Level Ice and pressure ridge data collection during 1981 *Polar Sea* deployment.

Project No. 124.—Beaufort Sea multiyear ice ridges and land-fast ice crystal orientation.

Project No. 125.—Ice pressure measurement technology.

Project No. 126.—Slope protection development for Beaufort Sea Island.

Project No. 127.—Bering/Chukchi Seas ice concentration study.

Project No. 128.—Speed and ice depth sonar.

Project No. 129.—1980 freezeup study of Barrier Island Chain and Harrison Bay.

Project No. 130.—Large scale ice strength tests 1980–81.

Project No. 131.—Harrison Bay ice movement study.

Project No. 132.—Lower Cook Inlet COST No. 1 well.

Project No. 133.—Reindeer Island stratigraphic test.

Project No. 134.—Norton Basin COST No. 1 well.

Project No. 135.—Acquisition and interpretation of SLAR ice imagery for the Bering Sea Area.

Project No. 136.—Beaufort Sea shear zone monitoring, 1980–81.

Project No. 137.—Feasibility of a year-round offshore loading terminal in Norton Sound.

Project No. 138.—Statistical data on 1981 Beaufort, Chukchi and Bering Sea ice ridging using a laser profilometer.

Project No. 139.—Beaufort Sea multiyear ice features study (BMIFS).

Project No. 140.—Study of technical and economic feasibility of oil and gas pipelines and crude oil loading terminals in the Norton Sound, Alaska.

Project No. 141.—Protection of offshore arctic pipelines.

Project No. 142.—Bering Sea oceanographic measurement program.

Project No. 143.—Mechanical properties of sea ice.

Project No. 144.—SAR 1981 data of Beaufort and Chukchi Sea Ice.

Project No. 145.—Summer ice conditions in the Alaskan Beaufort Sea.

Project No. 146.—Review and update of summer ice conditions in the Alaska Beaufort Sea.

Project No. 147.—1981 Beaufort Sea summer oceanographic program.

Project No. 148.—1981 breakup study of the Barrier Islands and Harrison Bay.
Project No. 149.—Bering Sea cost well program.
Project No. 150.—1981 Bowhead Whale population study.
Project No. 151.—Retained fill island systems in the Beaufort Sea.
Project No. 152.—Punching shear resistance of concrete structures.
Project No. 153.—Harrison Bay ice gouge study.
Project No. 154.—Digital stereometry.
Project No. 155.—Evaluation of artificial islands for Norton Sound.
Project No. 156.—Ice interaction with sloping barriers.
Project No. 157.—Model tests of first-year ridges (1977).
Project No. 158.—Model tests of first-year ridges (1979).
Project No. 159.—Preliminary design for icebreaking tankers for the Bering Sea.
Project No. 160.—1981 Freezeup Study of Barrier Island chain and Harrison Bay.
Project No. 161.—Field test of control de erosion in-situ shore protection techniques.
Project No. 162.—Norton Sound production structure.
Project No. 163.—Synthesis of Bering Sea ice and current information for the Norton and Navarin Basins.
Project No. 164.—Bering Sea soil boring programs, 1981 Norton Sound and St. George Basin.
Project No. 165.—Digitizing and analyzing airborne laser profilometer data of Arctic Sea Ice.
Project No. 166.—Norton Sound ice behavior study.
Project No. 167.—Harrison Bay ice movement study 1981-82.
Project No. 168.—Air curtain destructor.
Project No. 169.—Transfer systems and storage systems.
Project No. 170.—Beach clean-up machine.
Project No. 171.—Geotechnical characteristics of artificial islands.
Project No. 172.—Large scale stability test of sand-bagged slope protection.
Project No. 173.—Southern Bering Sea production system study.
Project No. 174.—Arctic cone exploratory structure.
Project No. 175.—1982 level ice and pressure ridge characteristics in Bering and Chukchi Seas during deployment of USCGC *Polar Star*.
Project No. 176.—Additional ice movement stations in Harrison Bay.
Project No. 177.—SAR data of Bering, Beaufort and Chukchi Sea ice—April, 1982 survey.
Project No. 178.—Statistical data on sea ice ridging—April, 1982 survey.
Project No. 179.—Soil boring program—Harrison Bay.
Project No. 180.—Cone penetrometer program—Harrison Bay.
Project No. 181.—Ridge building.
Project No. 182.—Ice sheet fracture.
Project No. 183.—Harrison Bay artifical island study.
Project No. 184.—Digitization of project No. 111.
Project No. 185.—Navarin and North Aleutian geotechnical.

PROJECT NO. 1

Title.—Bristol Bay Environmental Report.

Purpose and method.—To establish an environmental background for considering operational problems which might be anticipated in Bristol Bay, a search of the literature was conducted, which included existing weather records, ship observations and other pertinent reports. Collected data was interpreted and compiled into three volumes of reports. Weather data was input into a hindcast model, so that wind, wave, current and sea level data can be estimated for Bristol Bay areas. Data from 35 extreme storms were included.

Contractor.—Ocean Science and Engineering, Inc., 45 Del Ray Avenue, Washington, D.C. 20014.

Operator.—None—All participants executed agreement with OSE, Inc.

Report.—Bristol Bay Environmental Report—three volumes.

Cost.—$144,000—cost to next participant $24,000.

Participants.—Sun, Shell, Mobil, Exxon, CONOCO, Cities Services, Chevron, ARCO, Amoco and 1 other.

Final report.—December, 1970.

Confidentiality.—Indefinite.

PROJECT NO. 2

Title.—Sea Ice Investigation, Beaufort Sea.

Purpose and method.—Near-shore fast ice characteristics were studied. The primary objective was to determine type and magnitude of ice movement, and character of ice and bottom sediments where measurements were made.

Surveyed lines were established perpendicular to the coast, and some distance onto the ice. These lines were re-surveyed at intervals, and the survey data compared. Ice cores were taken and bottom sediments sampled at several points on the survey lines.

Polexi established several lines during the winter of 1969-1970, and incorporated data from a survey by Standard of California done in the 1968-1969 winter, and a similar survey done by Mobil in the 1969-1970 winter.

Contractor.—Polexi (AINA)—Arctic Institute of North America, 1619 New Hampshire Avenue, N.W. Washington, D.C. 20009.

Operator.—None—All participants executed agreement with Polexi.

Report.—Offshore Ice Investigation—Polexi.

Cost.—$198,000—cost to next participant $18,536.

Participants.—Hamiltion Brothers, Union, Texaco, Sun, Shell, Phillips, Mobil, Gulf, Exxon, CONOCO, Cities Service, Chevron, ARCO, Amoco, and 1 other.

Final report.—December, 1970.

Confidentiality.—March 16, 1980.

PROJECT NO. 3

Title.—Chukchi Sea—Arctic Coast Environmental and Ecological Data Analysis.

Purpose and method.—To provide a comprehensive base for planning offshore exploration and development operations in the Chukchi Sea and adjacent coastal areas. Oceanographic and land based data in the form of magentic tapes, punch cards, computer printouts, open-file research reports, card indices, raw data plot sheets, etc., were obtained from numerous U.S. Government agencies, universities, and private research centers. These data were analyzed in order to provide answers to specific offshore questions raised by operational problems associated with the following interrelated environmental and ecological elements:

Sea waves; Sea ice; Precipitation; Air and sea temperatures; Humidity and pressure; Wind velocity and direction; Visibility; ceiling, clouds, storms; Sea-water physical properties; Sea-bottom sediments; Bathymetry; Tides; Ocean currents; Earthquake activity; Tidal waves (tsunami); Permafrost; Wildlife; Aircraft flight operations; Logistics; Radio communications; U.S.S.R. political implications; and Dew Line information.

Contractor.—Continental Shelf Data Systems (CSDS), Division of Amuedo and Ivey, 155 South Madison, Suite 230, Denver, Colorado 80209.

Operator.—None—All participants required to execute a purchase agreement with CSDS for the use of these data.

Report.—The final report is in three volumes, containing 775 pages of text, diagrams, tables, charts and maps assimilating information on the above categories. Includes 12 bathymetric contour maps at the scale of 1″=16,000′.

Cost.—$8,120 text in two volumes (775 pages) $3,400 12 bathymetric maps.

Participants.—Sun, Phillips, Marathon, Exxon, CONOCO, Cities Service, Chevron, ARCO, Amoco, and 1 other.

Final report.—1971.

Confidentiality.—Each company that purchases these reports and/or bathymetric maps is required to execute a purchase agreement containing the following statement: "The data from this stsudy shall be kept and remain confidential by the Purchaser and shall not be disclosed or transferred to any party not a party to this Agreement; however, the data may be utilized by a purchasing company's affiliates, wholly owned subsidiaries, contractors and consultants, such as for the purpose of ship building, platform or pipeline construction, weather or oceanographic studies, and exploration planning."

PROJECT NO. 4

Title.—Chukchi Sea Environmental Study.

Purpose and method.—The report is a compilation and interpretation of historical geographic and environmental data for the Chukchi Sea area.

Contractor.—Ocean Science and Engineering, Inc.

Operator.—Contracted by Mobil Oil Corp., P.O. Box 5444, Terminal Annex, Denver, Colorado 80217.

Report.—Chukchi Sea Environmental Report.

Cost.—$3,000—cost to next participant $1,000.

Participants.—Mobil and Chevron.

Final Report.—June, 1970.
Confidentiality.—Unanimous consent of participants.

PROJECT NO. 5

Title.—Beaufort Sea-Arctic Coast Oceanographic and Climatologic Data Analysis.

Purpose and method.—To provide a comprehensive data base for planning offshore exploration and development operations in the Beaufort Sea and adjacent coastal areas. Oceanographic and land based data in the form of magnetic tapes, punch cards, computer print outs, open-file research reports, card indices, raw data plot sheets, etc., were obtained from numerous U.S. government agencies, universities, and private research centers. These data were analyzed in order to provide answers to specific offshore questions raised by operational problems associated with the following interrelated enviromental and ecological elements:

Sea waves; Ocean surface currents; Sea ice; Sea temperatures; Bathymetry; Tides; Storm conditions; Surface winds; Precipitation; visibility; Air Temperature; Communication Interference; Aircraft Flight Operations; Permafrost.

Contractor.—Continental Shelf Data Systems (CSDS), Division of Amuedo and Ivey, 155 South Madison, Suite 230, Denver, Colo. 80209.

Operator.—None—All participants required to execute a purchase agreement with CSDS for the use of these data.

Report.—The final copyrighted report contains 140 pages (14"x20") of text, diagrams, tables, charts and maps assimilating information on the above categories. Includes 12 bathymetric contour maps at the scale of 1" = 16,000".

Cost.—$4,100—text, one volume. $3,400—12 bathymetric maps.

Participants.—Union, Texaco, Shell, Phillips, Mobil, Exxon, Chevron, Sohio-BP, Amoco and 1 other.

Final report.—1969.

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PROJECT NO. 6

Title.—Beaufort Sea Reconnaissance.

Purpose and method.—To determine the distribution and characteristics of soils, sediments and ice and sub-ice oceanographic conditions, Point Storkersen to Milne Point, North Slope, Alaska.

Nineteen soil borings were drilled, by a "Becker" type drill, to depths of 10.5—125 feet. The samples were taken from various different surface environments. Field temperature readings were taken and samples were lab-tested for cohesion, expansion, consolidation, shear strength, density, moisture content, angle of repose, etc. Detailed lithographic descriptions of each boring were also done. Scuba dives through the ice at five different locations were made. The divers collected data on ice thickness, character, and sub-ice oceanographic bottom conditions and characteristics such as water currents, visibility, plant and animal life, etc. These studies provide basic data pertinent to the planning and designing of drilling and production facilities.

Contractor.—Marine Advisors Inc.

Operator.—Hamilton Brothers Oil Co., 1800 Broadway, Denver, Colo. 80202.

Reports.—Reconnaissance Studies of Soil, Sediments and Ice, Point Storkersen to Milne Point, Alaska.

Cost.—$241,000-cost to next participant $22,115.

Participants.—Hamilton Brothers, Union, Shell, Exxon, Chevron, Sohio-BP, Amoco and 2 others.

Final report.—August, 1970.

Confidentiality.—April 12, 1981.

PROJECT NO. 7

Title.—Beaufort Sea ice scouring.

Purpose and method.—The Beaufort Sea bottom was observed by Side-Scan Sonar, Sub-bottom Profiler, and Precision Fathometer to determine the extent and character of scour trenches caused by the movement of large ice features. Observations were made during two summer cruises with the Coast Guard, in the offshore area between Harrison Bay and the Canning River Delta. The first year's survey was conducted in water depths ranging from 50' to 250', and the second year from 50' to shore.

Contractor.—General Dynamics, electric boat Division, Eastern Point Road, Groton, Conn. 06340. Attn: Manager, Industrial Safety.

Operator.—None—All participants executed agreement with General Dynamics.

Report.—Ice Scouring on the Alaskan continental Shelf. Volumes I and II.

Cost.—$115,000—cost to next participant $15,681.

Participants.—Sun, Shell, Mobil, Gulf, Exxon, Chevron, Sohio-BP, ARCO and Amoco.

Final reports.—Volume I—November, 1971. Volume II—November, 1972.

Confidentiality.—November, 1977.

PROJECT NO. 8

Title.—North and South Bering Sea Environmental Study.

Purpose and method.—The report is a compilation and interpretation of historical geographic and environmental data from the Bering Sea.

Contractor.—Ocean Science and Engineering, Inc.

Operator.—Contracted by Mobil Oil Corporation P.O. Box 5444, Terminal Annex Denver, Colorado 80217

Report.—North and South Bering Sea Environmental Study.

Cost.—$6,000—cost to next participant $2,000.

Participants.—Mobil and Cities Service.

Final report.—October, 1970.

Confidentiality.—Unanimous consent of participants.

PROJECT NO. 9

Title.—Western Alaska (Onshore).

Purpose and method.—The report is a compilation and interpretation of historical geographic and environmental data for Western Alaska.

Contractor.—Ocean Science Engineering, Inc.

Operator.—Contracted by Mobil Oil Corporation P.O. Box 5444, terminal Annex Denver, Colorado 80217

Report.—Western Alaska Environmental Report.

Cost.—$3,000—cost to next participant $1,000.

Participants.—Mobil.

Final report.—July, 1971.

Confidentiality.—Consent of Operator.

PROJECT NO. 10

Title.—Arctic Marine Terminal Facilities, Chukchi Sea.

Purpose and method.—To determine the feasibility of constructing and operating a marine terminal in the arctic. Terminal and component concepts were screened to determine general technical feasibility taking into consideration know environmental and operating requirements, and a reasonable scheme of terminal development was selected for detailed study and cost analysis.

A scheme was selected that is suitable for staged construction to allow minimum commitment of money until construction experience is gained and behavior of the components in place can be observed. Several possible locations for the terminal are indicated and assumptions have been made with the help of knowledgeable personnel to estimate such parameters as soil conditions, sea ice forces, ship maneuverability in ice, etc.

Contractor.—Van Houten Associates, Inc.

Operator.—Esso Research and Engineering Co. Contact: Manager, Marine Department, Exxon Co. U.S.A. P.O. Box 2180, Houston, Tex. 77001.

Report.—Arctic Marine Terminal Facilities—Engineering Study.

Cost.—$1,271,586—cost to next participant $317,896.

Participants.—Exxon, Sohio-BP and ARCO.

Final Report.—November, 1969.

Confidentiality.—Expired.

PROJECT NO. 11

Title.—Offshore Oil Terminal Structure Facilities in the Chukschi Sea.

Purpose and method.—To design an offshore terminal in the Arctic Ocean for use of tankers but excluding the study of how tankers can get to the area, included is a study of various designs that take advantage of or protect from particular environmental conditions. This involves a study of subsurface soil conditions, meteorology, oceanology, and ice conditions in the area of interest. Operational criteria and port designs are set forth. Desirable research and field tests are recommended and construction considerations are outlined. Also, a glossary of arctic terms is included.

Contractor.—Federic R. Harris, Inc.

Operator.—Humble Oil & Refining Company (Now Exxon Company, U.S.A.) Contact: Manager, Marine Department, Exxon Co. U.S.A. P.O. Box 2180, Houston, Tex. 77001.

Report. Offshore Oil Terminal Structure Facilities in the Chukchi Sea—Feasibility Study.

Cost. $29,197—cost to next participant $7,300.

Participants. Exxon, Sohio-BP and ARCO.

Final report. December, 1968.

Confidentiality. Expired.

PROJECT NO. 12

Title.—Sea Ice Activity and Pressure Ridge Growth in the Beaufort Sea.

Purpose and method.—To study the mutual effects of sea ice—ice island interaction two grounded ice islands (Unak 1 and Unak 2) were surcharged with frozen sea water during the winter of 1968–69 to offset the anticipated ablation during the summer period. Pressure ridge formation and ice movement around the ice islands were observed and photographed during the next several months.

Contractor.—Institute of Arctic Environmental Engineering, University of Alaska.

Operator.—Humble Oil and Refining Company (Now Exxon Company, U.S.A.) Contact: Manager, Marine Department, Exxon Co., U.S.A. P.O. Box 2180, Houston, Tex. 77001.

Report.—AMTF-70-10001.

Cost.—$330,219—cost to next participant $82,550.

Participants.—Exxon, Sohio-BP and ARCO.

Final Report.—November, 1969.

Confidentiality.—Expired.

PROJECT NO. 13

Title.—Beaufort Sea Environmental Study.

Purpose and method.—This is a very general study for the region between Bering Straits and Victoria Island and reports on ice coverage, ice reporting and forecasting, transportation, tides and currents, bathmetry and meteorology. Similar studies for Svlabard, Norway, Greenland, Labrador, Hudson Bay, Canadian Arctic Islands, and Southern Alaska.

Contractor.—Marex Ltd, Cowes, United Kingdom, Marine Exploration Ltd., Marex H. O., High Street, Cowes, Ilse of White, England.

Operator.—Compagnie Francaise de Petrole.

Report.—Beaufort Sea Environmental Study. One of a set of eight regional studies.

Cost.—$49,000—cost to next participant $16,333.

Participants.—Sohio—BP.

PROJECT NO. 14

Title.—Study of Behavior of Oil Spills in the Arctic.

Purpose and method.—To study effects of oil spills in the arctic, a series of small controlled oil spill tests were conducted during the summer of 1970. These tests were designed to obtain information on the behavior of spilled crude oil, its resistance to cleanup, and the effectiveness of various methods to recover the oil. Tests were made on water between ice floes, under the ice, and on the ice surface.

Contractor.—U.S. Cost Guard.

Operator.—U.S. Coast Guard Contact: Manager, Marine Department, Exxon Co., U.S.A., P.O. Box 2180, Houston, Tex. 77001.

Report.—USCG Report 714108/A/001, 002 "A Study of the Behavior of Oil Spills in the Arctic."

Cost.—$15,000.

Participants.—Exxon.

Final report.—February, 1971.

Confidentiality.—Expired.

PROJECT NO. 15

Title.—Manhattan voyage study.

Purpose and method.—To determine the feasibility of shipping oil by tanker through the Northwest Passage and to obtain ice breaking criteria for future tanker design, two trips were made by a converted tanker to arctic waters. In the summer of 1969, the SS Manhattan with an icebreaker bow and strengthened hull completed a round trip through the Northwest Passage and tested icebreaking capabilities in Viscount Melville Sound. In the second voyage, the ship tested icebreaking capabilities in the Baffin Bay in the spring of 1970. The data obtained have been analyzed by various numerical methods and compared with model data.

Contractor.—Several contractors.

Operator.—Humble Oil & Refining Company (now Exxon Company, U.S.A.) Contact: Manager, Marine Department Exxon Co., U.S.A., P.O. Box 2180, Houston, Tex. 77001.

Report.—Arctec, Inc., No. 00170, Vol. 1 and 2 plus Appendices A-A5, B-K. Humble Oil & Refining Company (Now Exxon Company, U.S.A.) "Manhattan Spring 1970 Arctic Test Voyage."

Cost.—$40,000,000+—cost to next participant $2,000,000.

Participants.—Exxon, Sohio—BP and ARCO.

Final report.—December, 1970.

Confidentiality.—Expired.

PROJECT NO. 16

Title.—Arctic Tanker Design Study.

Purpose and method.—To design an icebreaker tanker for operation in arctic waters. Operational and scientific data acquired during the 1969 and 1970 test voyages on the Manhattan and ice model test results have been utilized to make a preliminary design for a future arctic tanker. These studies have resulted in establishing the characteristics of a workable and feasible first generation ship design. Further optimization can be expected in the future after additional model tests have been carried out and after actual experience is gained with operating tankers in the arctic.

Contractor.—Newport News Ship Building Company.

Operator.—Humble Oil & Refining Company (now Exxon Company, U.S.A.). Contact: Manager, Marine Department, Exxon Co., U.S.A., P.O. Box 2180, Houston, Tex. 77001.

Report.—Arctic Tanker Design Study.

Cost.—$1,614,977—cost to next participant $403,745.

Participants.—Exxon, Sohio-BP and ARCO.

Final report.—August, 1970.

Confidentiality.—Expired.

PROJECT NO. 17

Title.—Overflights: Nome to Resolute.

Purpose and method.—To observe and document ice conditions over the Nortwest Passage as a pre-requisite to traverses such as that by the Icebreaker Tanker, SS Manhattan. Using SLAR (side-looking airborn radar), overflights obtained raw photographic data. These data have been analyzed by the Raytheon Company and Philco-Ford Corporation to obtain a summary of ice conditions.

Contractor.—The Raytheon Company and Philco-Ford Corporation.

Operator.—Humble Oil & Refining Company (now Exxon Company, U.S.A.). Contact: Manager, Marine Department, Exxon Co., U.S.A., P.O. Box 2180, Houston, Tex. 77001.

Report.—"Analysis of SLAR Imagery of Sea and Fast Ice Areas" FR-4290-53, Raytheon Company. "SLAR Imagery Reports" Humble Purchase Order DC111414, Philco-Ford Corporation.

Cost.—$162,872—cost to next participant $40,718.

Participants.—Exxon, Sohio-BP and ARCO.

Final report.—1969.
Confidentiality.—Expired.

PROJECT NO. 18

Title.—Offshore Pipelaying on the Alaskan North Slope—Feasibility Study.

Purpose and method.—The technical and economic feasibility of offshore pipelaying methods for the Alaskan North Slope will be explored. The geographical area under study will lie between the Canning and Colville Rivers from the shoreline out to the 100 foot water depth contour. Both conventional and unconventional pipelaying techniques will be examined. The conventional techniques include laybarge, reelbarge and pull methods while unconventional techniques for near shore application include tunneling, suspension bridges and pipelaying on gravel berms built above the water line. Pipelaying from the ice surface will also be examined. The research will be of a preliminary nature to select promising methods for more detailed study. No environmental field data will be collected during the program; existing data will be used.

Contractor.—Shell Development Company, Pipeline Research and Development Laboratory, P.O. Box 35335, Houston, Tex. 77035.

Operator.—Shell Development Company.

Report.—"A Feasibility Study of Offshore Pipelaying in the Southern Beaufort Sea":

Volume 1—Summary report by S. K. Bhatia and T. Enger, Shell Development Co., Technical Progress Report 9(a) -73.

Volume 2—Appendices to Summary Report, Shell Development Co., Technical Progress Report 9(b) -73.

Volume 3—Ice Coverage Study, Shell Development Co., Technical Progress Report 9(c) -73.

Volume 4—Soils and Trenching, Shell Development Co., Technical Progress Report 9(d) -73.

Cost.—$60,000—cost to next participant $9,667.

Participants.—Shell, Mobil, Gulf, Exxon, Chevron, Sohio-BP, ARCO and Amoco.

Final report.—June, 1973.

Confidentiality.—June, 1983.

PROJECT NO. 19

Title.—Characteristics and Distribution of Nearshore Permafrost, Beaufort Sea.

Purpose and method.—To define the characteristics and distrubution of nearshore permafrost by drilling and sampling core holes near Barrow, Alaska. Cores will be taken and logged, bore hold temperature measured. Drilling will be attempted on a line from shore, across lagoons, on barrier islands, and seaward of the islands.

Contractor.—University of Alaska, Geophysical Institute, Arctic Coastal Engineering Program, Fairbanks, Alaska 99701.

Operator.—None—Project funded by the Office of Naval Research with a contribution from the AOGA membership.

Report.—Completed 1975.

Cost.—$30,000 ($5,000 from AOGA)—1973. $62,004 ($19,000 from AOGA)—1974.

Participants.—All AOGA members.

Confidentiality.—The report is public information.

PROJECT NO. 20

Title.—Sea Ice Dynamics and Properties, Beaufort Seas.

Purpose and method.—To gain a better understanding of the dynamic processes and stress levels which nearshore sea ice undergoes in generating its characteristic features. The ice will be observed on the Chukchi Sea shore near Barrow for a period commencing sometime in March, 1973 to near break-up. Observations will be made with radar equipment and the resulting imagery recorded on film using a time-lapse technique. Simultaneous measurements will be made of stress transducers imbedded in two dimensional patters in the land-fast sea ice.

Contractor.—University of Alaska, Geophysical Institute, Arctic Coastal Engineering Program, Fairbanks, Alaska 99701.

Operator.—None—Project funding mainly by Sea Grant with contribution from the AOGA membership.

Report.—Completed 1975.

Cost.—$65,000 ($13,600 from AOGA)—1973. $1,291,146 ($13,000 from AOGA)—1974.

Participants.—All AOGA members.

Confidentiality.—The report is public information.

PROJECT NO. 21

Title.—Arctic Oil Biodegradation.

Purpose and method.—To determine the oil biodegradation potential in the Arctic Ocean waters, studies of the biodegradation rates and temperature coeffecients of the metabolic processes were undertaken.

Contractor.—University of Alaska, Institute of Marine Science, Fairbanks, Alaska 99701.

Operator.—None—Project funded principally by the U.S. Coast Guard with a small contribution from the AOGA membership.

Report.—Interim report included in University of Alaska (Institute of Marine Science) No. R 72-3 "Base line Data Study of the Alaskan Arctic Aquatic Environment" will be complete in summer of 1973.

Cost.—$130,000 ($4,500 from AOGA).

Participants.—All AOGA members.

Confidentiality.—The report is public information.

PROJECT NO. 22

Title.—Investigation of Ice Forces on Cylindrical and Conical Offshore Structures.

Purpose and method.—Purpose is to investigate forces that a uniform sheet of ice can exert on cylindrical and conical shaped structures. The work was carried out with small scale models of cones, cylinders and ice, in a test cold room at Chevron Oil Field Research Company laboratory in La Habra, Calif. Results yield important data as to the magnitudes of force for the condition of the ice initially adhering to the cone, and for the condition when ice is prevented from adhering to the cone.

Contractor.—None.

Operator.—All work performed by Chevron Oil Field Research Co., P.O. Box 446, La Habra, Calif.

Reports.—An Experimental Investigation of Ice Forces on Cylindrical Structures. An Experimental Investigation of Ice Forces on Cone-Shaped Structures.

Cost.—$10,000 per participant (irrespective of number of participants).

Participants.—Sun, Shell, Phillips, Exxon, Chevron and Amoco.

Final reports.—September, 1973.

Confidentiality.—January 1, 1980.

PROJECT NO. 23

Title.—Artificial Ice Island Feasibility Study.

Purpose and method.—To study the physical processes applicable to artificial ice island construction in the near-slope area of the Beaufort Sea, and to assess the value of such a structure in terms of its utility, and for forces that may act upon it. If a construction process is found to be feasible, and a potential structure utilizable, the study will undertake to optimize the construction process, specify techniques and equipment, and outline a testing program which would verify the design parameters for construction.

Contractor.—Dames & Moore, Anchorage, Alaska.

Operator.—Mobile Oil Corp., P.O. Box 5444, Terminal Annex, Denver, Colo. 80217.

Report.—Feasibility Study, Construction of Artificial Ice Island in the Beaufort Sea.

Cost.—$68,000—cost to next participant $10,200.

Participants.—Sun, Shell, Mobil, Gulf, Exxon, Chevron, Sohio-BP Arco and Amoco.

Final report.—November, 1975.

Confidentiality.—Unanimous consent of participants.

PROJECT NO. 24

Title.—Analysis of Arctic Ocean Under-Ice Profiles.

Purpose and method.—Under-ice profile data recorded by "upward looking" sonar on the U.S. Navy's nuclear submarines SARGO and SEADRAGON during summer and winter 1960 cruises under the polar ice pack of the Beaufort Sea were analyzed to evaluate the ice parameters. Included statistical analysis of sea ice depth, linear frequency of under-ice pressure ridges, (Keels), frequency of occurrence of keels of different depths, percentage of ice at each depth, and shape and volume of under-ice masses. These under-ice profile data were recorded in strip chart form and are being digitized for computer analysis. Although thousands of miles of profile data exist, the present study concerns the analysis of two 50-mile segments of winter ice intersection at a right angle near 72°N, 150°W, and one 50-mile segment of summer ice near 74°N, 162°W. Results from this study show this unique source of data will be valuable for developing ice design criteria for arctic offshore structures.

Contractors.—LeSchack Associates, Ltd., 1111 University Boulevard West, Suite 116, Silver Spring, Md. 20902.

Report.—Analysis of Arctic Ocean Under-Ice Profiles.

Cost.—$48,500. Cost to next participant $12,125.

Participants.—Sun, Shell, Phillips, Exxon, Chevron and Amoco.

Final report.—July, 1975.

Confidentiality.—Unanimous consent of all participants.

PROJECT NO. 25

Title.—Bering and Chukchi Seas—Feasibility Study of Production Operations and Marine Crude Transportation During Ice-Covered Periods.

Purpose and method.—All available sea ice data will be collected to evaluate the feasiblity of conducting production operations and supporting marine crude tanker transporation in the winter ice-covered Bering and Chukchi Seas. The study area is bounded by the Alaska coast in the East, Aleutian Islands on the south, the U.S.A.-U.S.S.R. boundary on the west and 72° latitude on the north (just north of Pt. Barrow).

These seas present winter ice conditions for which little is known on how best to conduct production and marine tankering operations on a year-round basis. Data is needed to develop drilling and operating costs, and to compare relative advantages of tanker, pipline, or combination pipleline/tanker transportation schemes.

The study will collect all available and pertinent sea ice data including information from satellite imagery, provide insight into operating problems, estimate crude tankering costs, and evaluate alternative tankering and/or ice breaking schemes. Task 1 to develop a technical and management plan was completed prior to offering the study for joint participation

Contractor.—Arctec, Inc., 9104 Red Branch Road, Columbia, Md. 21045.

Operator.—Standard Oil Company of California c/o Chevron Oil Field Research Co., Box 446, La Habra, Calif. 90631. Attention: Mr. Larry D. Brooks.

Report.—Feasibility Study of Bering/Chukchi Seas Production and Marine Transportation System.

Cost.—$70,000—cost to next participant 150 percent of prorata cost at time of late joining.

Participants.—Union, Sun, Shell, Phillips, Mobil, Marathon. Gulf, Getty, Chevron, ARCO, Amoco and 1 other.

Final report.—November, 1975.

Confidentiality.—November 1, 1980.

PROJECT NO. 26

Title.—Beaufort Sea Ice Statistics from Satellite (ERTS-1 Data).

Purpose and method.—To derive statistics of sea ice distibutions in the Beaufort Sea using imagery for ERTS-1 (Earth Resources Technology Satellite). Statistics to be derived will include: the location of the edge of the pack ice; the frequency of the currents of pack ice invasion along the coast; the size distribution of ice flows in relation to the edge of pack ice; ice movement; the extent and dates of break-up of shore fast ice. Also, studies will be conducted using imagery and digitized data to verify further techniques to identify ice types developed in earlier studies.

Contractor.—Environmental Research & Technology, Inc. 696 Virginia Road, Concord, Mass. 01742.

Operator.—None.

Report.—Beaufort Sea Ice Statistics from ERTS-1 Data.

Cost.—$77,000—cost to next participant $23,100.

Participants.—Shell, Gulf, Exxon and Sohio-BP.

Final report.—July, 1976.

Confidentiality.—July, 1981.

PROJECT NO. 27

Title.—Ice Movement Study for Winter, 1975-1976, Beaufort Sea. Alaska.

Purpose and method.—To measure the rate and extent of ice movement at select locations in the shore fast area between Cape Halkett and Tigvariak Island.

A mechanical reel system was used to measure movement data which was recorded on magnetic tape at the sites and also telemetered to a base station located in the Prudhoe Bay area. In addition to movement data, temperature, winds, tide, current and ice strain were collecterd and recorded.

Contractor.—Oceanographic Services, Inc.

Operator.—Amoco Production Co. Security Life Bldg., Denver, Colo. 80202.

Report.—Beaufort Sea Ice Movement Study, 1975-76.

Cost.—$457,777—cost to next participant $84,365.

Participants.—Shell, Mobil, Gulf, Exxon, Chevron, Sohio-BP, ARCO and Amoco.

Final report.—September, 1976.

Confidentiality.—June 1, 1981.

PROJECT NO. 28

Title.—Aerial Reconnaissance—Prudhoe Bay-Harrison, Point Lay and Kotzebue Sound and Ice Movement—Prudhoe Bay-Harrison Bay.

Purpose and method.—Aerial reconnaissance was flown at Harrison Bay-Prudhoe Bay, Point Lay, and Kotzebue Sound during the winter 1974-75 in November, March and June. A total of 54 separate flight lines were photographed over the ice to document ice features and to detect changes in features over the winter.

Ice movement measurements in the shore fast areas of Prudhoe Bay-Harrison Bay were made at three locations. The stations were located southeast of Thetis Island, northeast of Stump Island and west of Reindeer Island. Movements were computed by calculating the change of location of stations set up on the ice with respect to land. The stations were located with laser surveying devices in November, March and May.

Operator.—Amoco Production Co., Security Life Bldg., Denver, Colo. 80202.

Reports.—Ice Conditions in the Prudhoe Bay-Harrison Bay, Point Lay and Kotzebue Sound Areas, Winter 1974-75.

Landfast Ice Movement in the Brudhoe Bay-Harrison Bay area, Winter 1974-75.

Cost.—$20,000 per participant.

Participants.—Shall, Exxon, Chevron, Sohio-BP, ARCO and Amoco.

Final reports.—December, 1975.

Confidentiality.—January 1, 1981.

PROJECT NO. 29

Title.—Bering/Chukchi Sea Ice Statistics from Satellite Data.

Purpose and method.—Examine sea ice conditions in the entire Bering/Chukchi Seas using Landsat and meteorological satellite data available to date. Particular emphasis will be placed on basins where lease sales are scheduled (St. George, Bristol, Norton and Hope Basins) plus other interest areas such as the Bering Strait and possible locations of terminals. Statistics to be derived included: the seasonal progressive edges of the ice and its consistency by years; floe-size distribution; characteristics and behavior of shore-fact ice; ice movement patterns and rates; the extent and dates of break-up of shore-fast ice.

Contractor.—Environmental Research & Technology, Inc., 696 Virginia Road, Concord, Mass. 01742.

Operator.—None.

Report.—Further Studies of Sea-Ice Conditions in the Bering/Chukchi Seas Using Satellite Data.

Cost.—$78,500—cost to next participant $23,550.

Participants.—Mobil, Gulf, Exxon and Sohio-BP.

Final report.—Project initiated February 15, 1977. Project completed March, 1979.

Confidentiality.—March 1, 1984.

PROJECT NO. 30

Title.—Unmanned Subsea Work Vehicle Study.

Purpose and method.—To evaluate the application of the U.S. Navy unmanned subsea technology to exploration and production tasks. The Navy CURV (Controlled Underwater Recovery Vehicle) technology is assessed against necessary offshore subsea operations.

The study includes an evaluation of under-ice application.

Contractor.—Proto-Power Management Corporation, Mystic, Conn.

Operator.—Amoco Production Co., Research Department, Tulsa, Okla.

Report.—Cable Controlled Underwater Recovery Vehicle—Technology Transfer Program. Two volumes.

Cost.—$53,600—cost to next participant $7,675. Only penalty is inability to have been present at sea trials.

Participants.—Shell, Phillips, Amoco and 3 others.

Final report.—December, 1975.

Confidentiality.—December, 1978.

PROJECT NO. 31

Title.—Crushing Pressure of Ice.

Purpose and method.—To provide an up-to-date assessment of what is known and unknown about the failure of the ice sheets crushing against cylindrical structures.

Several theoretical analyses and previous experimental measurements of the forces resulting from ice crushing against cylindrical structures are described in this report. Included are new, unpublished theoretical results based on elastic-plastic limit analyses and finite element calculations, as well as an interpretation of ice force measurements that removes some of the ambiguity associated with existing experimental observations.

Ice properties are reviewed and new measurements of ice strength under triaxial loading conditions are presented. The use of an anisotropic, pressure-sensitive failure criterior is suggested to describe ice strength in further theoretical analyses of failure of ice.

Contractor.—None.

Operator.—Exxon Production Research Company.

Report.—Crushing Pressure of Ice.

Cost.—$10,000.

Participants.—Shell, Gulf, Exxon and Amoco.

Final report.—December, 1975.

Confidentiality.—December 31, 1979.

PROJECT NO. 32.

Title.—Triaxial Ice Measurements.

Purpose and method.—To determine the strength of freshwater ice under triaxial stress states.

A series of 163 laboratory tests were conducted on colunar grained ice with horizontal C-axis. The test program consisted of 99 triaxial compression tests, 49 uniaxial compression tests, and 15 uniaxial tension test. Confining pressure was varied in the range of 0–400 psi to determine the pressure dependence of ice strength. The anisotrophy of ice strength was characterized by testing samples with the axial load applied at three angles (0°, 45°, 90°) with respect to the crystal growth direction. Variations in ice temperature and strain rates were also included in this test program.

Contractor.—Arctec Canada, Ltd.

Operator.—Exxon Production Research Co.

Report.—Triaxial Ice Measurements.

Cost.—$10,000.

Participants.—Shell, Exxon and Chevron.

Final report.—June, 1975.

Confidentiality.—December 31, 1979.

PROJECT NO. 33

Title.—Arctic Ice Islands.

Purpose and method.—To develop a model to estimate the risk of collisions between ice islands and selected offshore sites in the coastal waters of the Beaufort Sea.

A Monte Carlo model was developed to carry out the objectives of this project. The model assumes that ice islands enter the Beaufort Sea across a line extending from the approximate center of the Pacific gyral to the northwest corner of Banks Island. The model allows the islands to move in the gyral under the influence of currents and either ground and breakup along the coast, continue in the gyral, or exit into the Amundsen Gulf or the Eurasian sector of the Arctic Ocean. Input data for the Monte Carlo model were obtained from information gained by reviewing the literature. The source, number, drift paths, and the possibilities of ice island grounding and breaking up were reviewed.

The report covering this project describes the Monte Carlo model, evaluates its realism and develops ice island encounter probabilities at ten sites in the southern

Beaufort Sea. Appendices contain the historical, physical and statistical information obtained from the literature review.

Contractor.—None.

Operator.—Exxon Production Co.

Report.—Arctic Ice Islands.

Cost.—$10,000.

Participants.—Shell, Exxon, and Amoco.

Final report.—December, 1975.

Confidentiality.—December 31, 1979.

PROJECT NO. 34

Title.—Feasiblity Study for construction of Artificial Gravel Islands, Beaufort Sea, Alaska.

Purpose and methods.—To develop reliable information and data regarding equipment requirements, U.S. equipment availability and procurement, island construction and equipment transportation costs, equipment scheduling, requirements for materials and recommendations for their exploration, and gravel island design requirements for the construction of both temporary and permanent gravel islands.

Contractor.—Hydronamic B. V., Sliedrecht, Holland.

Operator.—Amoco Production Co., Security Life Building, Denver, Colo. 80202.

Report.—The Building of Artificial Islands in the offshore Area Between Flaxman Island and Cape Halkett.

Cost.—$76,750—cost to next participant, 150 percent of prorata cost at time of late joining.

Participants.—Hamilton Brothers, Shell, Mobil, Marathon, Gulf, Getty, Exxon, Chevron, Sohio-BP, ARCO, Amoco and 2 others.

Final report.—March, 1976.

Confidentiality.—June 1, 1981.

PROJECT NO. 35

Title.—Summer Ice Conditions, North Alaskan Coast.

Purpose and methods.—To document and perform preliminary statistical analyses of the historical data on summer ice conditions off the north Alaska coast. These types of analyses will be required to assess the feasibility and cost of operating at different locations in the study area during various times of the summer season. Historical data were obtained for 1953 throught 1975 from ice observer flights logs, ship reports, satellite imagery and U.S. and Canadian annual summary reports.

Contractor.—Sea Ice Consultants.

Operator.—Amoco Production Company (Research Department) P.O. Box 591, Tulsa, Okla. 74102.

Reports.—All reports entitled:

Sea Ice Conditions Along the North Coast of Alaska—Cape Halkett to Camden Bay—June through October, 1953 throught 1975.

Volume I—Report, Plots and Tabulations. Volume II—Tabulations and Worksheets. Volume III—Ice Charts, 1953-64. Volume IV—Ice Charts, 1965-75. Supplemental report prepared by Amoco.

Cost.—$5,000 (independent of number of participants).

Participants.—Shell, Gulf, Exxon, ARCO, Amoco and Sohio-BP.

Final report.—December, 1976.

Confidentiality.—January 1, 1982.

PROJECT NO. 36

Title.—Artificial Ice Islands, Harrison Bay, Beaufort Sea.

Purpose and method.—To build an ice island capable of being used as a drilling platform for oil exploration in shallow arctic offshore situations. The ice island had to be acceptable to all federal and state agencies for permitting purposes.

The location of the island is in Harrison Bay on the North Plains of Alaska at the mouth of the Colville River. Once the natural ice had frozen thick enought to support activity, water was pumped from beneath the ice to on top of the ice in thin layers and allowed to freeze. This was continued until an ice block was formed that reached from the surface of the water to the bottom of the bay.

A comprehensive report containing formation and data about the island has been prepared. Ice strength, salinity, weather, ice movements, point load tests, temperature profiles, radiant energy evaluations are included in the reports. A section on cold room study which covers freezing rates and strenght of ice with respect to temperature and salinity is also included.

Operating information is provided as to the type of equipment and technique of physically building the ice island.

Contractor.—Dames & Moore.

Operator.—Union Oil Company of California.

Reports.—Arctic Ice Island Study, Harrison Bay, Alaska by Fredrick C. Duthweiler, 1975.

Grounded Ice Islands Field & Laboratory Research Interim Report by F. C. Duthweiler & M. E. Utt.

Grounded Ice Island Field & Laboratory Research Final Report by F. C. Duthweiler & M. E. Utt.

Cost.—$20,000.

Participants.—Union, Shell, Mobil, Gulf, Exxon, Amoco and 1 other.

Final reports.—November, 1976.

Confidentiality.—December 31, 1980.

PROJECT NO. 37

Title.—Bering Sea—St. George Basin/Western Bristol Bay Satellite Sea Ice and Ocean Current Mapping (BESAT).

Purpose and method.—Define ice conditions in the St. George Basin area relative to floating drilling vessel, bottom founded structures and ocean shipping. Landsat satellite imagery will be used to define seasonal ice edge location, types of ice present, precent of ice cover, floe size and extent of shore fast ice.

Contractor.—Escatech, Long Beach, Calif.

Operator.—Marathon.

Report.—Satellite Sea Ice and Ocean Current Investigations of the Bering Sea—St. George Basin—OCS Lease Area.

Cost.—$40,700—cost to next participant $5,088.

Participants.—Amoco, Arco, Cities Service, Conoco, Exxon, Getty Gulf, Marathon, Pennzoil, Sun, Union, (Superior a late participant).

Final report.—March 17, 1977 (revised April 21, 1977).

Confidentiality.—Unanimous consent of participants.

PROJECT NO. 38

Title.—Saline Ice Triaxial Tests.

Purpose and method.—To determine the strength of laboratory grown saline ice under triaxial stress states.

A series of 153 uniaxial tests will be conducted on laboratory grown, columar-grained saline ice with horizontal c-axis. The ice salinity will be 3/ and 6/. Confining pressure will vary in the range of 0–400 psi to determine the dependence of strength on hydrostatic stress.

The anistrophy of ice strength will be characterized by testing samples with the axial load applied at three angles (0, 45, 90) with respect to the crystal growth direction. Variations in ice temperature and strain rate will also be included in the program. The estimated time required for the program is 12 months.

Contractor.—Arctec Canada, Ltd.

Operator.—None.

Report.—Triaxial Compressure Tests on Lab Growth Saline Ice.

Cost.—$134,000—cost to next participant $33,500.

Participants.—Shell, Gulf, Exxon, Chevron and Amoco.

Final report.—November, 1977.

Confidentiality.—December 31, 1982.

PROJECT NO. 39

Title.—Beaufort Sea Ice Movement Study 1976–77.

Purpose and method.—To measure the rate and extent of ice movement at select locations in the shore fast area between Cape Halkett and Brownlow Point.

The study is a continuation of the 1975–76 study (AOGA Project #27) and is also expanded to cover additional area from Tigvariak Island to Brownlow Point.

A mechanical reel system was used to measure movement data which was recorded on magnetic tape at sites and also telementered to a base station located in the Prudhoe Bay area. In addition to movement data, temperature, wind, tide, current and ice strain have been collected and recorded.

An aerial photography program was included as a part of the 1976-77 survey to obtain statistical information on ice conditions in the nearshore area. This program included 16 flight lines at 3,000 feet altitude, extending offshore for 20 miles, and one flight line flown at 6,000 feet altitude, extending offshore for 60 miles. These flight lines, obtained both in March and June, 1977, were spaced intermittently along the coast over the ice movement study area. Also obtained during the June, 1977 flight program were 52 high level (1200' alt.) flight lines, 30 miles offshore from the coastline. This high level program provides complete coverage of the entire ice movement study area to aid in mapping trends of ice features found on the low level flights.

Contractor.—Oceanographic Services, Inc.

Operator.—None—coordinated by Amoco Production Company.

Report.—Beaufort Sea, Ice Movement Study, 1976-77 (two volumes).

Cost.—$530,114—cost to next participant $92,402. Participation in AOGA Project #27 not prerequisite to this study.

Participants.—Shell, Mobil, Gulf, Exxon, Chevron, Sohio-BP, ARCO and Amoco.

Final report.—June, 1978.

Confidentiality.—June 1, 1982

PROJECT NO. 40

Title.—Developing Ice Ridging Statistics in the Bering and Chukchi Seas from Submarine Under-Ice Profile Data.

Purpose and method.—Under ice profile data recorded by "upward looking" sonar on the U.S. Navy's nuclear submarines Sargo and Seadragon on 17, one hundred foot stip-charts covering approximately 1,800 miles of cruise track between 60°N and 72°N during 1960-62 in the Bering and Chukchi Seas are analyzed for ice corphology parameters. Data analysis is for 2-4 mile segments and summarized in 50 mile intervals and includes statistics of sea ice depth occurrence at deeper than 6, 15, 30 and 45 feet, linear occurance, frequency at each depth, percent of profile below each depth, frequency of ice mass below 10 feet and other. Statistics are particularly directed at providing useful data for design and use of offshore drilling vessels, offshore structures and transportation systems.

Contractor.—LeSchack Associates, Ltd., 1111 University Boulevard West, Suite 116, Silver Spring, Md. 20902.

Operator.—None.

Report.—Developing Ice Ridging Statistics in the Bering and Chukchi Seas from Submarine Under-Ice Profile Data.

Cost.—$31,800—cost to next participant $9,540.

Participants.—Shell, Mobil, Marathon, Exxon, and Amoco.

Final report.—March, 1977.

Confidentiality.—Unlimited.

PROJECT NO. 41

Title.—Oil Spill Response in the Nearshore Beaufort Sea.

Purpose and method.—To identify the currently available techniques and equipment that may be suitable for use in the nearshore Beaufort Sea, along with environmental conditions under which they could be applied; to identify those operating conditions in the nearshore Beaufort Sea under which currently available techniques and equipment are judged to be inadequate; and to identify the research objectives which must be satisfied in order to obtain the desired level of capability in oil spill response. To develop an engineering research development program directed toward meeting these objectives.

Contractor.—Arctec, Inc., Columbia, Md.

Operator.—ARCO, Exxon, Shell.

Report.—"Oil Spill Response in the Nearshore Beaufort Sea".

Cost.—$40,000—cost to next participant $3,636.

Participants.—Shell, Phillips, Mobil, Gulf, Getty, Exxon, Cities Service, Chevron, Sohio-BP, ARCO, and Amoco.

Final report.—August, 1978.

Confidentiality.—May 1, 1982.

PROJECT NO. 42

Title.—Beaufort Sea Ice Movement Study, 1977-78.

Purpose and method.—To measure the magnitude and rate of ice movement at twelve locations in the landfast ice between Cape Halkett and Flaxman Island off the Alaskan North Coast. The measurement program is scheduled from November through May. An OSI wire/reel ice movement system will be used to measure the ice motions and data will be telemetered to Deadhorse.

To obtain stereo aerial photography of the sea ice in the study area and perform analyses on the geometry and distribution of large ice features and surface roughness. This study is similar in scope to AOGA Project No. 39.

Contractor.—Oceanographic Services, Inc.

Operator.—None.

Report.—Beaufort Sea Ice Movement Study, 1977-78.

Cost.—$510,000—cost to next participant is estimated at $90,166.

Participants.—Shell, Mobil, Gulf, Getty, Exxon, Chevron, ARCO, and Amoco.

Final report.—January, 1979.

Confidentiality.—June 1, 1983.

PROJECT NO. 43

Title.—Aerial Mapping of 1978 Sea Ice in Norton Sound and Northern Bering Sea.

Purpose and method.—The project consists of flying approximately 1,200 miles of stereo photography over Norton Sound and the Northern Bering Sea at a negative scale of 1 inch=1,000 feet. Resultant photos will be spliced into continuous strips corresponding to individual flight line segments. Some 15 sections of these strips, each about 10 miles long, will be selected and analyzed to determine percentage of ice by type, frequency of ridging and rafting, and height and width of other surface features. Additional, less detailed, study will be conducted on all photos. To supplement the high resolution photographic data, applicable government satellite and other remote sensing data will be obtained, where possible. Ice charts and narrative of the entire 1977-78 ice season in the Bering Sea will be included.

Contractor.—Oceanographic Service, Inc. (OSI), Santa Barbara, Calif.

Operator.—None.

Report.—Aerial Mapping of 1978 Sea Ice in Norton Sound and Northern Bering Sea.

Cost.—$110,135—Cost to next participant $12,237+$10,000 late participation fee=$22,237.

Participants.—Amoco, ARCO, Sohio-BP, Chevron, Exxon, Gulf, Mobil and Shell.

Final report.—December 1, 1978.

Confidentiality.—November 1, 1983.

PROJECT NO. 44

Title.—Beaufort Sea Meteorological and Oceanographic Measurement Program (BEAUMOP).

Purpose and method.—To gather oceanographic and meteorological data for the Alaska Beaufort Sea. The objectives of this program are to measure winds, waves, currents, tides, storm surge, and barometric pressure at selected sites within the Prudhoe Bay offshore region. Measurement sites have been selected to complement data being collected by the University of Alaska and to provide a spatial description of the oceanographic conditions. It is intended to utilize the data for calibration in the development of a hindcast model of the region.

Contractor.—Oceanographic Services, Inc. (OSI), Santa Barbara, Calif.

Operator.—Gulf Research and Development Co., P.O. Box 36506, Houston, Tex. 77036.

Report.—Beaufort Sea Meteorogolical and Oceanographic Measurement Program (BEAUMOP), Summer 1978.

Cost.—$285,875. Cost to next participant $53,600.

Participants.—ARCO, Sohio-BP, Exxon, Getty, Gulf, Marathon, Mobil and Shell.

Final report.—February, 1979.

Confidentiality.—Earliest of one year after the Beaufort Sea nearshore lease sale of five years after program termination.

PROJECT NO. 45

Title.—Arctic Mobile Drilling Structure.

Purpose and method.—To develop a conically shaped, mobile exploratory drilling system preliminary design suitable for the Beaufort Sea environment.

This project consists of the results of a Preliminary Design Study and supporting studies for a gravity foundation steel-hulled cone drilling system. Major systems are defined and cost and weight estimates are given.

Supporting studies include predicted ice forces, foundation capacity predictions, hull heat transfer analyses, and preliminary predictions of wave forces and floating dynamic properties of the system. Results of preliminary studies that investigate various alternate structural systems are also included.

Contractor.—The Offshore Company, Chevron Oil Field Research, P.M.B. Systems Engineering, Spencer Engineering Associates.

Operator.—Standard Oil Company of California.

Reports.—Arctic Mobil Drilling Structure: Preliminary Design Study (two volumes) and six other reports.

Cost.—$50,000 fixed fee to original 6 licensees. License fee now $60,000.

Participants.—Amoco, ARCO, Chevron, Exxon and Shell.

Final report.—April, 1978.

Confidentiality.—Seven years from effective date of license.

PROJECT NO. 46

Title.—Study of Methods and Costs of Offshore Pipeline Installation and Trenching in the Beaufort Sea, Alaska.

Purpose and method.—To study methods and costs of installation and trenching of submarine pipelines for the Alaska Beaufort Sea. The study includes consideration of laying, protection/trenching, connection, and repair problems. It is limited primarily to methods and equipment currently available.

Typical values and ranges are defined for environmental parameters. The sudy determines the general feasibility, capabilities and limitations of various installations and burial techniques as a function of the environmental parameters. Equipment requirements are defined. Available methods for pipeline connection and tie-in are reviewed for their technical economical applicability in the Arctic. The study also assesses methods of pipeline repair for their applicability and time required to make repairs.

Two pipeline installation scenarios are evaluated in detail. Sufficient details of unit costs, equipment, and time requirement are provided to facilitate preparation of cost estimates for other cases.

Contractor.—R. J. Brown and Associates of America, Inc.

Operator.—Shell Oil Company.

Report.—Study of Methods and Costs of Offshore Pipeline Installation, Trenching, Connection and Repair, Beaufort Sea, Alaska.

Cost.—$125,650. Cost to next participant—$16,335.

Participants.—ARCO, Sohio-BP, Chevron, Exxon, Getty, Marathon, Mobil, Phillips and Shell.

Final report.—October, 1978.

Confidentiality.—To the earliest of one year following the Federal/State Beaufort Sea lease sale or five years after termination of the study.

PROJECT NO. 47

Title.—Yukon Delta Rubble Pile Investigation 1978.

Purpose and method.—To measure the submerged profile and local bathymetry around ice rubble piles found in the Yukon River Delta area of Alaska. Ice samples were also taken of the rubble piles for the determination of salinity and particulate material characteristics. The submerged profiles were measured using sonar techniques.

Contractor.—Oceanographic Services, Inc., P.O. Box 6783, Santa Barbara, California.

Operator.—None.

Report.—Yukon Delta Rubble Pile Analysis of 1978.

Cost.—$24,960. Cost to next participant $8,567. Participation in AOGA Project #43 is prerequisite for this study.

Participants.—ARCO, Sohio-BP, Chevron, Exxon, Mobil and Shell.

Final report.—February, 1979.

Confidentiality.—November 1, 1983.

PROJECT NO. 48

Title.—Interpretation of Existing Geological, Geophysical and Engineering Data, 1971-1977, for the Beaufort Sea, Alaska.

Purpose and method.—To identify and interpret geophysical and physical data collected by the USGS and CRREL.

Corehold, Seismic, Vibracaore and dive site data was investigated by provided information on recent sediments, ice gouging and permafrost. The investigation covered the 1979 lease sale area and immediate adjacent area. The report concerned itself with two different subjects, the geological aspects and the engineering aspects of the sea bottom.

Contractor.—Harding-Lawson Associates.

Operator.—None.

Report.—Interpretation of Geophysical, Geological and Engineering Data, 1971-1977, for the Beaufort Sea, Alaska.

Cost.—$119,800. Cost to next participant approximately $16,000.

Participants.—ARCO, Chevron, Exxon, Getty, Gulf, Marathon, Mobil and Shell.

Final report.—April 1, 1979.

Confidentiality.—In effect until one year after the Beaufort Sea Lease Sale or five years after termination of this study, whichever is later.

PROJECT NO. 49

Title.—Ice Island Experiment.

Purpose and method.—To extend the state of the art regarding the construction of ice islands and their use as temporary drilling platforms in shallow arctic waters.

A 1,200-foot diameter ice island is being constructed six miles north of the Prudhoe Bay East Dock at a water depth of ten feet. Construction is planned throughout the winter to achieve a completed island freeboard of 20 feet.

Various techniques to accelerate ice growth will be evaluated in this program. The island will be monitored continuously, from its commencement through fall freezeup following completion, to observe its resistence to lateral ice forces and its rate of deterioration during the summer open-water season.

Operator.—Exxon Company U.S.A.

Cost.—$2,400,000. Cost to next participant: 30 percent of cumulative cost to date plus 20 percent of remaining project cost.

Participants: Sohio-BP, Exxon, Mobil and Phillips.

Final report.—Established Spring, 1981.

Confidentiality.—Continues for two years after Beaufort Sea Lease sale or until January 1, 1985, whichever is earlier.

PROJECT NO. 50

Title.—Offshore Alaska Seismic Exposure Study (OASES).

Purpose and method.—To assess the seismic exposure as precisely as possible in terms of probability of exceedence in nine OCS area around Alaska. OASES is a statement of the state of the heart of seismic exposure methodology and is based entirely on nonproprietary data. The results are presented as contour maps of various ground motion parameters for several return periods. The results are compared with the 1978 API RP2A earthquake provisions.

Contractor.—Woodward-Clyde Consultants, San Francisco, California.

Operator.—For the Alaska Subarctic Offshore Committee (ASOC) Exxon Company, U.S.A.

Report.—Offshore Alaska Seismic Exposure Study Volumes I through V, plus and Executive Summary.

Cost.—$380,715.

Participants.—Members of ASOC.

Final report.—March, 1978.

Confidentiality.—Report released without confidentiality provisions. Copies have been distributed to the attached list.

Addressee list for OASES report.—Mr. Klaus H. Jacob, Lamont-Doherty, Geological Observatory, Palisades, N.Y., Dr. K. Stokoe, III, University of Texas, Austin, Tex., Dr. Latham, University of Texas, Marine Science, 700 Strand, Galveston, Tex., Mr. Gerald B. Shearer, USGS, Box 259, Anchorage, Alaska, Prof. Paul Jennings, California Institute of Technology, Pasadena, Calif., Dr. Nathan Newark, University of Illinois, Urbana, Ill., Dr. M. D. Trifunac, University of Southern California, Los Angeles, Calif., Dr. Rudolph Englemann, Director, OCSEAP, NOAA, EPL, Boulder, Colo., Dr. Ted Algermissen, USGS, Denver, Colo., Dr. R. A. Page, USGS, Menlo Park, Calif., Prof. H. Shan, Earthquake Engineering Inst., Stanford University, Stanford, Calif., Dr. H. B. Seed, University of California, Berkeley, Calif., Dr. Allin Cornell, Massachusetts Institute of Technology, Cambridge, Mass., Prof. Paul H. Wirshing, University of Arizona, Tucson, Ariz., Prof. Fred Moses, Case Western Reserve University, Cleveland, Ohio, Prof. James T. P. Yao, Purdue University, W. Lafayette, Ind., Dr. Carl Kisslinger, University of Colorado, Boulder, Colo., Mr. Robert

L. Wesson, USGS-National Center, Reston, Va., Dr. B. Mohraz, Southern Methodist University, Dallas, Tex., Dr. C. Martin Duke, University of California, Los Angeles, Calif., Prof. A. S. Veletsos, Rice University, Houston, Tex., Dr. Juan Roederer, Institute of Geophysics, University of Alaska, Fairbanks, Alaska, and Dr. John Blume, URS/J. A. Blume & Associates, San Francisco, Calif.

PROJECT NO. 51

Title.—Aerial Mapping of 1979 Sea Ice in the Norton Sound and Northern Bering Sea.

Purpose and method.—to obtain and analyze 1,500 miles of stereo aerial photography of sea ice in Norton Sound and the Northern Bering Sea. Visual analyses will be performed at ten mile intervals to determine the amount of open water, floe size, ridge heights, ridging frequency, and preferred orientations. Analyses also include digitizing, profiling, and computing ridge statistics on 118 selected ten mile segments. Special ice features such as rubble piles, floebergs, etc., will also be documented.

To evaluate NASA's side looking airborne radar (SLAR) imagery and scanning multiband microwave radiometer (SMMR) data as tools to remotely gather sea ice data. The NASA imagery will be obtained through the NASA/AOGA Bering Sea Cooperative experiment. The sea ice aerial photography obtained by OSI during the NASA overflights will be used as "ground truth" data in this investigation.

Contractor.—Oceanographic Services, Inc.

Operator.—None.

Report.—Aerial Mapping of Sea Ice in the Bering Sea, 1979. A report will also be prepared for NASA evaluating the SLAR and SMMR data as part of the NASA/AOGA Bering Sea Cooperative Experiment.

Cost.—Total estimated cost of $140,790. Cost to next participant is estimated at $25,643.

Participants.—Amoco, ARCO, Sohio-BP, Chevron, Exxon, Gulf, Mobil and Shell.

Final report.—September, 1980.

Confidentiality.—November 1, 1984.

PROJECT NO. 52

Title.—Beaufort Sea Ice Movement Study, 1978–79.

Purpose and method.—To measure the magnitude and rate of ice movement at three locations in the landfast ice in the vicinity of Reindeer and Narwhal Islands off the Alaskan North Coast. The measurement program is scheduled for November through May. An OSI wire/reel ice movement system will be used to measure the ice motions and data will be telemetered to Deadshore.

This study is similar to the ice movement portion of AOGA PROJECT No. 42, but of reduced scope.

Contractor.—Oceanographic Services, Inc.

Operator.—None.

Report.—Beaufort Sea Ice Movement Study, 1978–79.

Cost.—Total estimated cost of $133,876. Cost to next participant is estimated at $46,775.

Participants.—ARCO, Sohio-BP, Chevron, and Exxon.

Final report.—February, 1980.

Confidentiality.—October 1, 1984.

PROJECT NO. 53

Title.—Beaufort Sea Ice Movement Studies (BSIMS) Three-Year Summary and Analysis.

Purpose and method.—To reanalyze and summarize three winters (1975–76, 1976–77, and 1977–78) of ice movement and ice conditions data obtained by OSI and Amoco off the Alaskan North Coast. The results are to be presented in a form which can be directly used in planning offshore Arctic operations. Tasks to be performed include preparation of: net hourly ice movement tables, detailed plots of ice movement during extreme events, and statistics on extreme ice features and sea ice surface roughness. An attempt will also be made to understand the cause of selected major ice movement events.

Contractor.—Oceanographic Services, Inc.

Operator.—None.

Report.—BSIMS Three-Year Summary and Analysis.

Cost.—Total estimated cost of $168,092. Cost to next participant is estimated at $33,676. In addition, AOGA projects 27, 39 and 42 are prerequisites.

Participants.—Amoco, ARCO, Chevron, Exxon, Gulf, Mobil, Shell and Sohio.

Final report.—February, 1980.

Confidentiality.—October 1, 1984.

PROJECT NO. 54

Title.—Norton Sound and Northern Bering Sea Rubble Pile Investigations, 1978-79.

Purpose and method.—To investigate the origin, movement, physical characteristics and overall distribution of large pieces of consolidated ice rubble found in Norton Sound and the Northern Bering Sea.

Large ice rubble piles were previously observed as a part of Norton Sound aerial photographic programs conducted by OSI during 1976-1977 and 1977-1978.

The program will begin with reconnaissance flights in the Norton Sound area to monitor the appearance of the rubble piles. Once they appear, the following programs will be initiated: precision aerial photography; field measurements; the deployment of satellite positioning buoys to determine movement; and reconnaissance flights to monitor the rubble piles during ice breakup.

Contractor.—Oceanographic Services, Inc.

Operator.—None.

Report.—Northern Bering Sea Rubble Pile Investigation, 1978-79.

Cost.—$166,339. Cost to next participant $33,762.

Participants.—Amoco, ARCO, Exxon, Gulf, Mobil and Shell.

Final report.—July, 1980.

Confidentiality.—October 1, 1984.

PROJECT NO. 55

Title.—Beaufort Sea First-Year Ice Features Survey.

Purpose and method.—To investigate first-year pressure ridges and rubble piles in the Alaskan Beaufort Sea. The objectives of this program are: to provide extreme first-year ridge and rubble pile populations that can be correlated to give frequency of ridgestructure interaction; to establish statistical ridge and rubble pile geometries for pileup and loading design criteria; and to determine internal ridge characteristics. The program will include both an on-the-ice field survey and aerial photography. The results of this study should aid in assessing the threat of first-year ice features to offshore structures and installations.

Contractor and operator.—Gulf Research and Development Co., P.O. Box 36506, Houston, Tex. 77036.

Report.—Volume I—Field Investigations; Volume II—Aerial Photography; Volume III—Digitized Profile; and Volume IV—Flightline Mosaics.

Cost.—$163,000. Cost to next participant $30,562.

Participants.—ARCO, Chevron, CONOCO, Exxon, Gulf, Mobil, Phillips, and Shell.

Final report.—January, 1980.

Confidentiality.—Earliest of one year after the Beaufort Sea nearshore lease sale or five years after program termination.

PROJECT NO. 56

Title.—Bering Sea Phase I Oceanographic Study.

Purpose and method.—The project has two principal objectives. The first objective is to provide preliminary estimates of extreme oceanographic conditions in the following basins: Bristol Bay, St. George, Navarin, St. Lawrence, and Norton Sound. The second objective is to assess the scope of a subsequent Phase II Oceanographic Study, including definition of the types and location of wind and wave data needed for model calibration and definition of the wave generation and dissipation mechanisms that must be included in the model.

The project will involve computer modeling of severe historical storms. Deep water wave hindcasts will be made for the 20 worst historical storms using the calibrated ODGP spectral wave model and accounting for ice cover. Shallow water wave transformations will be studied using the calibrated ODGP spectral wave model and accounting for ice cover. Shallow water wave transformations will be studied using both two-dimensional shoaling and refraction models and one-dimensional models that allow both wave generation and dissipation in shallow water. Storm surges in Norton Sound will be calculated for several storms. Finally, statistical extrapolation procedures will be used to predict return periods for rare, extreme wave conditions.

Contractors.—Oceanweather, Inc.; Ocean Research & Engineering.

Operator.—None.

Cost.—$203,500. Cost to next participant $20,350.

Participants.—ARCO, Sohio-BP, Chevron, Cities Service, Exxon, Gulf, Mobil, Shell and Superior.

Final report.—October, 1980.

Confidentiality.—February 1, 1984.

PROJECT NO. 57

Title.—Reindeer Island Ice Island and Ice Bridge Studies.

Purpose and method.—The report will describe the design, construction and maintenance of the 8-mile ice road and ice bridge constructed during the winter of 1978–79 to Reindeer Island. The report includes a critical review of the construction and maintenance equipment used on the project including detailed cost data and a discussion of potential problem areas. The study program also included physical measurements of ice properties in the area and the results of a dynamic stress and strain measurement program conducted as part of the project.

Contractor.—FENCO Consultants Inc., 805—8th Avenue, S.W., Calgary, Alberta, Canada T2P 1H7.

Operator.—Sohio Petroleum Co.

Report.—Reindeer Island Ice Road and Ice Bridge Studies 1978–79.

Cost.—$4,430,000. Cost to next participant:

Participants.—18 members of RIST well 1978–79.

Final report.—September 1, 1979.

PROJECT NO. 58

Title.—Arctic Skimmer Final Design Project.

Purpose and method.—To complete final construction drawings for a Centrifugal Systems, Inc. (CSI) arctic catamaran skimmer.

This vessel would be able to safely recover spilled oil in wave heights up to three feet with some ice cover. The design is not an icebreaking hull, but rather ice strengthened to resist impact of ice chunks during cleanup.

The design is for a maximum draft of four feet; on board separation and storage facilities for 70–100 barrels of oil and provides for offloading the recovered oil rapidly to temporary storage. Vessel length is 48 feet.

Contractor.—Centrifugal Systems, Inc., Houston, Tex.

Operator.—Sohio Petroleum Co.

Report.—CSI ARCAT 229 Arctic Oil Skimmer Final Design Project.

Cost.—$68,000. Cost to next participant: Membership in ABSORB.

Participants.—Amoco, ARCO, Chevron, Cities Service, Exxon, Getty, Gulf, Marathon, Mobil, Phillips, Shell, Sohio, Union, Tenneco, Conoco.

Final report.—April, 1980.

Confidentiality.—Until construction or release by AOGA.

PROJECT NO. 59

Title.—Arctic Dispersant Study.

Purpose and method.—To screen a group of oil dispersants to determine their suitability in arctic marine conditions. Thirty-two commercial dispersants were tested using the Mobil Oil Static Oil Dispersion test, a method which determines the quantity of oil which can be dispersed in seawater using a specified amount of chemical. The rate of separation of the oil/water dispersion was also measured. The results of this study should aid in preparing for arctic leasing and exploration activities. This investigation does not address toxicity or required dosage rates. These topics are addressed in proposed future studies by LPRC.

Contractor and operator.—Arco Oil and Gas Co., Box 360 Anchorage, Alaska 99510.

Report.—Arctic Dispersant Project—Task I.

Cost.—$20,000. No late participants.

Participants.—Amoco, Arco, Chevron, Citgo, Getty, Gulf, Marathon, Mobil, Phillips, Shell, Sohio, Union, Champlin, Exxon.

Final report.—May, 1979.

Confidentiality.—Report will be held confidential until such time as the data are published. ARCO retains the right to publish the data from this study one year after the Joint Federal-State Beaufort Sea Lease Sale.

PROJECT NO. 60

Title.—Review Air Cushion Platform Capabilities for Oilspill Cleanup in the Alaskan Beaufort Sea.

Purpose and method.—To review the capabilities of air cushion platforms which might be considered for use offshore.

The review will include a discussion of the service for which platform was designed, its equipment and operational requirements, its capital and operating costs, operational experience, reliability and availability.

The capability for use in oil spill tasks will be a prime consideration with all aspects of response and practicality considered and reviewed.

Contractor.—D.F. Dickens, Yellowknife, Y.T., Canada.

Operator.—Shell Development Co.

Report.—Review of state-of-the-art air cushion vehicle capabilities in support of oilspill cleanup operations in the nearshore Alaskan Beaufort Sea.

Cost.—$31,729. Cost to next participant $3,430.

Participants.—13.

Final report.—March, 1980.

Confidentiality.—February 15, 1984.

PROJECT NO. 61

Title.—Conical Structure Test Program.

Purpose and method.—To investigate the interaction of a shallow-angle conical structure with ice sheets containing ridges and with large unconsolidated and partially consolidated ice rubble. A total of eight ridges, eight unconsolidated rubble fields, and five partially consolidated rubble fields were tested. The conical structure was a 30° cone with a waterline diameter of 12 feet.

Several previous test programs have investigated the interaction of ice with 45° cones. Based on an assessment of the size of multi-year ridges which may be encountered in the Arctic and on an estimate of the maximum force which might be exerted by such features, it seems likely that conical shapes less than 45° may be needed to limit design horizontal forces. Therefore, the structure was designed to investigate ice interaction with a cone having an angle of 30° to the horizontal. The interaction of conical structures with ice rubble fields also needed to be studied and results were obtained for various combinations of rubble field parameters.

The program was intended to provide a data based which could be used to verify computational methods for predicting ice forces. The model structure does not necessarily represent an optimal or feasible structure. The modeled ice conditions do not necessarily represent design conditions.

Contractor.—Esso Resources Canada Limited.

Operator.—Exxon Production Research Co.

Report.—Conical Structure Test Program, Winter 1978-79.

Cost.—About $400,000 with six participants. Cost to next participant is $95,000. Funds contributed by participants in excess of program costs will be distributed equally to participants.

Participants.—Chevron, Dome, Exxon, Gulf, Shell, and Sohio.

Final report.—August, 1980.

Confidentiality.—February 1, 1984.

PROJECT NO. 62

Title.—Under-Ice Rig Noise Measurement Program.

Purpose and method.—To measure drilling rig-produced noise and its propagation under floating ice in the Prudhoe Bay area.

Existing literature contains no direct measurements on sufficient data to accurately predict the acoustic environmental impact of arctic offshore drilling operations.

Acoustic pressure measurements were taken in the water through holes drilled in the ice with very sensitive hydrophones obtained from the Navy. The measurement locations were made at known distances from the Reindeer Island COST well and from the SOHIO-BP-Alaska well on Niakuk 3. These field measurements were then analyzed to determine background and rig-produced noise levels as well as attenuation rates of the rig-produced noises.

Contractor.—Bolt, Beranek, and Newman Inc.

Operator.—Exxon.

Report.—Measurement of underwater acoustic noise in Prudhoe Bay, Alaska. BBN technical memo No. 513.

Cost.—About $50,000. Cost to next participant $4,000.

Participants.—Amoco, ARCO, Sohio-BP, Chevron, Cities, Exxon, Getty, Gulf, Marathon, Mobil, Phillips, Shell, and Union.

Final report.—May, 1979.

Confidentiality.—Unlimited.

PROJECT NO. 63

Title.—Beaufort Sea Extreme and Normal Oceanographic Conditions Study.

Purpose and method.—To develop preliminary estimates of stormgenerated wave, current and surge conditions in the Beaufort Sea during the relatively ice-free or open water season of July to October.

Historical meteorological data are analyzed to determine the characteristics of severe storms. Historical ice cover data are used to determine available fetch. Storm windfields are developed for 12 storms. Waves are hindcast with a directional wave spectra model based on the JONSWAP parametric wave model. Currents and storm surges are hindcast with a proprietary model developed by Shell Development Company. Standard extreme value statistical analysis are used to estimate as a function of annual exceedance probability winds, waves, currents and surges.

The study also addresses normal summer oceanographic conditions and exteme wind speeds during the winter.

Contractor.—Oceanweather, Inc. and Sea Ice Consultants, Inc.

Operator.—Shell Development Co.

Report.—1. Hindcast study of Windfields and Wave Spectra for Severe Storms in the Beaufort Sea—Oceanweather, Inc.

2. Beaufort Sea Storm Wind and Wave Study—Shell Dev. Co.

3. Beaufort Sea Storm Surge and Current Study—Shell Dev. Co.

4. Beaufort Sea Normal Meteorological and Oceonographic Conditions—Shell Dev. Co.

Cost.—$20,000 per participant.

Participants.—Shell, Mobil.

Final report.—April, 1979.

Confidentiality.—April, 1989.

PROJECT NO. 64

Title.—Bering Sea Aerial Photography Data—1977.

Purpose and method.—To acquire high resolution aerial photography of Norton Sound and Bering Sea ice, and to analyze the photography to determine the size, shape, elevation, frequency, and distribution of ice features.

Over 1800 statute miles of Norton Sound, Bering Sea and Bristol Bay ice conditions were photographed in stereo in April 1977. Photos from selected lines were visually analyzed to determine percent ice coverage, ice types, floe sizes, types of ice features and roughness. Selected stereo models were analyzed, digitized and the vertical digital profiles prepared for statistical analysis. Descriptive narratives, vertical profiles, special features profiles and statistical tables for 24 selected areas, each about 10 miles long, were prepared.

The 1977 Bering Sea aerial photography program resulted in an extensive collection of photogrammetric quality ice photographs and corresponding ice surface elevation profiles. The work provides an insight as to the nature, variability, and roughness of sea ice in Norton Sound and the Bering Sea.

Contractor.—Oceanographic Services, Inc.

Operator.—Exxon Production Research Company.

Reports.—Bering Sea Aerial Photography Final Report; Bering Sea Aerial Photography summary report; digitized profile plots, blue line air photo mosaics.

Cost.—$15,000 + $1,000 (approximately) reproduction costs per report.

Participants.—Amoco, ARCO, Chevron, Exxon, Gulf and Mobil.

Final report.—January, 1978.

Confidentiality.—Five years from date of agreement.

PROJECT NO. 65

Title.—Beaufort Sea Drilling Effluent Disposal Study.

Purpose and method.—The objective is to assess impacts of over-ice and under-ice drilling effluent disposal techniques upon the benthic and epibenthic communities and demersal fish that may or may not be tied to the benthic invertebrates as a food source.

The methods and procedures by which the objectives are to be accomplished are as follows:

(1) *Discharge up to 100 barrels of drilling* effluent by gravity feed from disposal tank trucks through holes in the sea ice at selected locations; (2) Release drilling effluents as a liquid or solid onto surface of sea ice; (3) Simulated above ice disposal: drilling effluent would be deposited onto the sea floor through a grid of holes in the ice; (4) Static bioassay tests would be conducted upon active drilling mud and cuttings obtained directly from a wellsite; and (5) Mathematical modeling will be used to establish a method of predicting the dispersion and mixing of both above ice and below ice discharge of drilling mud and cuttings.

Contractor.—Northern Technical Services, 900 W. Fifth Avenue, Suite 240, Anchorage, Alaska 99501.

Operator.—Sohio Petroleum Co.

Report.—Beaufort Sea Drilling Effluent Disposal Study.

Cost.—$731,000.

Participants.—Amerada Hess, Amoco, ARCO, Chevron, Cities, CONOCO, Exxon, Getty, Gulf, Idemitsu, Marathon, Mobil, Phillips, Shell, Tenneco, Texas Eastern, Union and Sohio.

Final report.—Estimated November, 1979.

Confidentiality.—None.

PROJECT NO. 66

Title.—Yakutat Wave Data.

Purpose and method.—This is a report of additional wave data obtained after completion of the Group Oceanographic Survey in the Gulf of Alaska.

Contractor.—Intersea Research, Inc.

Operator.—Marine Advisor, Inc.

Report.—Volume 7—Recorded Data.

Cost.—$22,984. Cost to next participant $—.

Participant.—20—Amoco.

Final report.—October 1970.

PROJECT NO. 67

Title.—Group Oceanographic Survey—Gulf of Alaska.

Purpose and method.—The purpose of this program was to obtain oceanographical and climatalogical historical data and then hindcast winds and waves based on a few in-ocean measurement sensors taking ocean temperature, currents, wave heights, and periods. The report in eight volumes provides oceanographic, climatalogic and environmental data for the coastal and continental shelf area, 850 miles long. Extreme wave heights for a hundredth year recurring storm are estimated to exceed 100 feet based on a hindcast of 30 storms. In-ocean measurements were obtained for one year at Yakutat and were used to calibrate the hindcasting of normal and operational waves. The measuring station was located in 60 feet of water which is too shallow for extreme storms to reach and no compensation was achieved for wave heights of 20 feet or more. The hindcast of five representative years has served as valuable data in analyzing exploratory drilling vessel motion and hence drilling time for location in the study area.

Contractor.—Marine Advisers, Inc. (Bendix).

Operator.—Chevron U.S.A., Inc.

Report.—Gulf of Alaska Group Oceanographic Survey Phase I Area (10 vols. & supplement) September, 1970.

Cost.—$830,000. Cost to next participant $62,250.

Participants.—Alaskco, Amoco, ARCO, BP, Chevron, Cities, CONOCO, Exxon, Gulf, Marathon, Mobil, Murphy, Phillips, Placid, Shell, Getty, Sun, Tenneco, Texaco, Union.

Final report.—September, 1970.

Confidentiality.—June 1, 1981.

PROJECT NO. 68

Title.—Weather Forecast Trial.

Purpose and method.—The purpose was to determine the feasibility of wind and wave forecasting in the Gulf of Alaska during the winter months and to compile measured wave data during this most severe season. The data from the waverider buoy was transmitted to the weather office at Yakutat airport. Data was transmitted with regular forecasts to the Santa Barbara office by teletype. Forecasts were made based on these data and compared to real events in the forecast period. The report presents data obtained including forecasting experience and accuracy.

Contractor.—Oceanographic Services, Inc. (OSI).

Operator.—Exxon.

Report.—Wave and Weather Forecast Study, Gulf of Alaska, July, 1972.

Cost.—$38,000. $4,825 fixed cost per participant.

Participant.—Amoco.

Final report.—1972.

PROJECT NO. 69

Title.—1973 Soil Boring Program.

Purpose and method.—The purpose of this study was to obtain information on the engineering properties of the subsea-floor soil to aid feasiblity and cost studies for future development in the area Icy Bay to Kayak Island. The study presents data on nine surface drop cores taken at three locations and a soil boring with 225.5 feet of penetration.

Contractor.—Exploration Services Co., Inc.

Operator.—Shell Oil Co.

Report.—Gulf of Alaska Soil Boring Project, 1973 (4 vols.).

Cost.—$359,000. Cost to next participant $—.

Participants.—Amoco, ARCO, Chevron, Conoco, Marathon, Mobil, Phillips, Shell, Sun.

Final report.—1973.

PROJECT NO. 70

Intentionally omitted.—Duplication of No. 80.

PROJECT NO. 71

Title.—ARCO COST Well.

Purpose and method.—The objective was to drill a stratigraphic test well to 16,000 feet at a nonproductive location. Drilling ceased on October 10, 1975 at 5,000 feet when rig had to move off due to weather. All data still remains confidential.

Contractor.—Global Conception, Drilling Vessel.

Operator.—ARCO.

Report.—Guld of Alaska COST Well.

Cost.—$11,930,000. No late participants.

Participants.—Al-Aquitaine, Amerada Hess, American Petrofina, Amoco, ARCO, BP, Cities, CONOCO, Diamond Shamrock, Exxon, Getty, Gulf, Marathon, Mobil, Pennzoil, Phillips, Placid, Shell, Skelly, SOCAL, Sun, Superior, Tenneco, Texaco, Texas Eastern, Union.

Final report.—Well completed October 9, 1975.

Confidentiality.—Expired.

PROJECT NO. 72

Title.—Lab Dynamic Soil Analysis.

Purpose and method.—The purpose was to take laboratory measurements of the soil samples from Gulf of Alaska covering large strains rates under cyclic loading.

Contractor.—BB&N/Geotechnical Engineers, Inc.

Operator.—BB&N.

Report.—"Report on Test Program on Soil Samples Obtained from boring in Gulf of Alaska" November, 1975—BB&N.

"Shear Strength of Soils and Cyclic Loading" November, 1975—Geotechnical Engineers, Inc.

Cost.—$25,000.

Participants.—Five.

Final report.—November, 1975.

Confidentiality.—November, 1978.

PROJECT NO. 73

Title.—Oil-Spill Trajectory (Two Reports).

Purpose and method.—The purpose was to determine the fate of oil from a Gulf of Alaska spill using existing data. The direction of a spill movement was assessed by seasons. Also the probable time the spill would arrive at the beach was determined as well as the probability of what beach segments the spill would arrive at.

Contractor.—IRC and Chevron.

Operator.—Chevron U.S.A., Inc.

Report.[1]—Dr. Clayton McAuliffe, Chevron, gave his report to the August 1975, Gulf of Alaska Sale Hearing.

IRC's "Numerical Simulation of Oil-Spill Trajectories in the Northern Gulf of Alaska", September, 1975.

Cost.—$5,000.

Participants.—American Independent, American Petrofina, Amoco, ARCO, Ashland, BP, Champlin, Cities, Clinton, CONOCO, Depco, Exxon, Getty, Gulf, Marathon, Mobil, Murphy, National Cooperative Refining, PanCanadian Petroleum, Pennzoil, Phillips, Placid, Shell, SOCAL, Sun, Tenneco, Texaco, Union.

Final report.—1975.

Confidentiality.—None.

PROJECT NO. 74

Title.—Socio-Economic Impact of Drilling and Production.

Purpose and method.—The purpose was to determine the social and economic impact of offshore drilling and production in the state of Alaska with special emphasis on the coastal area of Northeast Gulf of Alaska. The study concentrated on the labor requirements and market, effects of activities on government supplied facilities (schools, sewers, etc) and the impact on the state of Alaska population.

Contractor.—Mathematical Sciences Northwest, Inc.

Operator.—GOA Operators Committee.

Report.—"An Economic and Social Impact Study of Oil related Activites, Gulf of Alaska", May 5, 1975.

Cost.—$80,000.

Participants.—GOAOC Membership.

Final report.—1975.

PROJECT NO. 75

Title.—Sea and Seabed Floor Properties.

Purpose and methods.—The purpose of this study was to determine sea floor and subsea floor properties through acoustical profiling and soil samples. Approximately 3,000 miles of multiscanner acoustic profiles were taken from Yakutat to Kayak Island to Middleton Island. Approximately 60 massive piston samples were taken to define subsea floor composition and verify the acoustic data. Geotechnical sample analysis was performed on board ship and in the laboratory. The final report includes a description of the surveys taken, data reduction and analysis, and a description of all cores taken.

Contractor.—BBN/Geotechnical Engineers, Inc.

Operator.—BB&N.

Report.—Geotechnical Core Hole Program (with associated hazard maps) Gulf of Alaska, August, 1975.

Cost.—$60,000 per participant.

Participants.—Amoco.

Final report.—August, 1975.

Confidentiality.—August, 1978.

PROJECT NO. 76

Title.—Seismic Risk Analysis for the Gulf of Alaska.

Purpose and method.—The purpose of the program was to evaluate earthquake records for seismic activity in the area and apply simple probabilistic theory to determine the seismic risk in the Eastern Gulf of Alaska.

Contractor.—John Wiggins Co.

Report.—"Seismic Risk Analysis for the Gulf of Alaska" September, 1975.

Cost.—$20,000.

Participants.—GOAOC membership

Final report.—September, 1975.

PROJECT NO. 77

Title.—Superstructure icing.

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[1] These reports no longer available.

Purpose and method.—This study is a literature search on the incidence of superstructure icing in the Gulf of Alaska area. It looks at the causes and seriousness of superstructure icing, i.e., icing from salt spray and fog on boats, choppers and drilling vessels.

Contractor.—CRREL.

Operator.—Marathon.

Report.—Ice Accumulation on Fixed and Floating Ocean Structures.

Cost.—$8,500—cost to next paticipant: cost of report reproduction.

Participants.—Amoco, ARCO, BP, Conoco, Exxon. Gulf, Marathon, Mobil, Murphy, Phillips, Shell, Socal, Sun and one other.

Final report.—September, 1975.

Confidentiality.—September, 1976.

PROJECT NO. 78

Title.—1974 Ocean Current Measurement Program.

Purpose and method.—The purpose of the study is to determine current speed and direction at 10 locations in the Gulf of Alaska from Yakutat to Kayak Island and Kayak Island to Middleton. Buoys with three current meters (on bottom, mid-depth, and near-surface) were installed at the chosen locations for 30 days. Temperature and salinity measurements were made at the time the buoys were installed. Routine weather observations including anemometer readings on the vessel were taken at six hour intervals. Five thousand drift cards and 500 drift bottles were released throughout the vessels track. All data obtained was accumulated and statistically analyzed by computer to document and predict current conditions in this area. Seven locations were actually occupied. Program data was supplemented with two or three NOAA locations, November 1974–March 1975.

Contractor.—BB&N.

Operator.—None.

Report.—A Data Collection, Analysis, and Simulation Program to Investigate Ocean Currents, North East Gulf of Alaska (2 vols.) Sept. 1975.

Cost.—$20,000 per participant.

Participants.—Amoco, ARCO, Conoco, Exxon, Gulf, Marathon, Mobil, Shell.

Final report.—September, 1975.

PROJECT NO. 79

Title.—Gulf of Alaska Hindcast Evaluation (WHEP).

Purpose and method.—The purpose of the program was to evaluate the Lockheed model's ability to preduct wave forces by comparing predicted values to those measured in GAWWMP. The use of this data permitted comparison of wave heights and some comparison of spectral data.

Contractor.—Intersea Research Corp.

Operator.—Marathon.

Report.—"Gulf of Alaska Hindcast Evaluation, First Report—September-November 1974 Data", May, 1975.

"Second Report—December 1974–February 1975 Data", August, 1975.

"Final Report—March 1975–May 1975 and Tri-Quarterly Data Summary", March, 1976.

Cost.—$69,000—cost to next participant: cost of report reproduction.

Participants.—Amoco, ARCO, BP, Conoco, Exxon, Gulf, Marathon Mobil, Murphy, Phillips, Shell, Socal, Sun.

Final report.—1975–1976.

Confidentiality.—March, 1981.

PROJECT NO. 80

Title.—Earthquake Soil Response Analysis.

Purpose and method.—The purpose of this study was for Shell to interact with Woodward-Clyde to develop and verify a non-liner soil reaction computer program under cyclic loading and to then use the program in conjunction with the data collected from Shell's dynamic soil analysis program. This new program gives soil reaction which although much smaller than those obtained in the first dynamic soil analysis program are considered much more realistic.

Contractor.—Woodward-Clyde.

Operator.—Shell Oil Co.

Report.—"Studies of Strains and Displacements During Earthquakes—Boring No. 2 Site—Gulf of Alaska", by Woodward-Clyde Consultants, January 12, 1976.

"Simple Shear Cyclic Tests on Normal Marine Clay from Icy Bay Area, Gulf of Alaska", by Woodward-Clyde Consultants, February, 1976.

"Study of Earthquake Response of Soft Clay Sites Considering Degradation Effects", by Woodward-Clyde Consultants, June 18, 1976.

Cost.—$60,648.

Participants.—Amoco, ARCO, Marathon, Mobil, Phillips, Shell, Socal, USGS.

Confidentiality.—Released by Shell Oil Company to AEIDC on June 22, 1981.

PROJECT NO. 81

Title.—Gulf of Alaska Meteorological and Oceanographic Forecasting Program (MOFP).

Purpose and method.—The objective was to build a weather prediction computer model and practice forecasting to insure its capability and accuracy at predicting weather for operating in the Gulf of Alaska area. This was done by modifying an existing weather prediction model to fit the Gulf of Alaska. Accuracy checks were run against measured wind and waves form GAWWMP.

Contractor.—Ocean Routes, Inc.

Operator.—Marathon Oil Co.

Report.—Gulf of Alaska Meterorological and Oceanographic Forecasting Program (Volumes I-III).

Cost.—$416,000—Cost to next participant: $78,022.

Participants.—ARCO, Exxon, Gulf, Marathon, Mobil, Shell, Socal, Sun.

Final report.—September, 1976.

Confidentiality.—Unanimous consent of participants.

PROJECT NO. 82

Title.—Gulf of Alaska Wave and Wind Measurement Program (GAWWMP).

Purpose and method.—The program employs deployment of 15 wave rider buoys in clusters of three each at five locations. The stations are close enough to provide geographically continuous data around the Gulf of Alaska (Yakutat to Chirikos). Weather stations will be placed in exposed shore locations near the wave measurement stations to develop meteorological data for correlation to the wave data for forecasting.

Contractor.—Marathon.

Operator.—Intersea Research Corp.

Report.—Gulf of Alaska Wave and Wind Measurement Program, 1974—May, 1976 (13 Vols.)

Cost.—$1.3 million—cost to next participant: cost of report reproduction.

Participants.—Amoco, ARCO, BP, Conoco, Exxon, Gulf, Marathon Mobil, Murphy, Phillips, Shell, Socal, Sun.

Final report.—July, 1976.

Confidentiality.—December 16, 1981.

PROJECT NO. 83

Title.—Seismic Risk Analysis for the Gulf of Alaska.

Purpose and method.—The purpose of this program was to define the effect of various earthquake intensities on platforms up to an 8.6 richter scale earthquake. Various earthquakes (acceleration level and duration) were applied to a platform design through computer programs. The degree of damage and/or failure was rated. The objective was to establish adequate platform design criteria for given levels of earthquakes which may be expected in the various Alaska areas.

Contractor.—Shell.

Operator.—Shell.

Report.—Seismic Risk Analysis for the Gulf of Alaska.

Cost.—$36,000. Cost to next participant $1,241.

Participants.—GOAOC Membership.

Final report.—September, 1975.

Confidentiality.—None.

PROJECT NO. 84

Title.—Gulf of Alaska Wave Hindcasting Pilot Study (GAPS).

Purpose and method.—The objective was to develop and calibrate a hindcast model for hindcasting historical storms in the Gulf of Alaska. Initially, the model will be calibrated against three storms measured in the GAWWMP program. Final calibration will be against four more GAWWMP storms and a 1955 storm considered one of the more severe will be hindcasted.

Phase 2 of this program to perform hindcast using the calibrated model is not recommended due to the declining interest in the Gulf of Alaska.

Contractor.—Ocean Weather, Inc. (Vince Cardone).

Operator.—Shell Development Co.

Report.—Gulf of Alaska Hindcasting Pilot Study—Phase I (GAPS).

Cost.—$197,500. Cost to next participant $72,250.

Participants.—ARCO, Chevron, Exxon, Mobil, Shell.

Final report.—April, 1979.

Confidentiality.—April, 1984.

PROJECT NO. 85

Title.—Bering Sea—St. George Basin/Western Bristol Bay Wave and Wind Measurement Program (BOMP).

Purpose and method.—To measure winds and waves in the proposed lease sale area for the determination of operating/design conditions.

Two groups of three Waverider buoys were deployed between Unimak Island and the Pribilof Islands. Concurrent winds were measured at St. Paul and St. George Islands.

Contractor.—Intersea Research Corp.

Operator.—Marathon.

Report.—"Bering Sea Oceanographic Measurement Program 1976-1977", four volumes.

Cost.—$522,805—cost to next participant: $98,026 (plus cost for late participation in companion AOGA Project #86 of $72,906. Program results not separately available prior to February, 1983).

Participants.—ARCO, Exxon, Getty, Gulf, Marathon, Mobil, Shell, and Sun.

Final report.—February, 1978.

Confidentiality.—February, 1983.

PROJECT NO. 86

Title.—Bering Sea Oceanographic Measurement Program 1977-1978 (extension of 1976-1977 BOMP).

Purpose and method.—To continue AOGA Project #85 with further measurements of winds and waves in the proposed lease sale area for the determination of operating/design conditions.

Two groups of three Waverider buoys were deployed between Unimak Island and the Pribilof Islands. Concurrent winds were measured at St. Paul Island.

A program extension of approximately $20,000 was approved on 1-15-79 to do a two-year summary of the BOMP data.

Contractor.—Interseas Research Corp.

Operator.—Marathon Oil Co.

Report.—"Bering Sea Oceanographic Measurement Program, 1977-1978 (Volumes V-VIII).

"Bering Sea Oceanographic Measurement Program, 1976-1978" (Volume IX—Two-Year Statistical Summaries of Wind and Wave Data Bases Plus Unimak Buoy Cluster Wave Data—Summer, 1977).

Cost.—$340,230—cost to next participant: $72,906 (Plus cost for late participation in companion AOGA Project #85 of $98,026. Program results not separately available prior to February, 1983).

PROJECT NO. 87

Title.—Yakutat Wave Data.

Purpose and method.—The objectives of this program were to determine the feasibility of wind and wave forecasting in the Gulf of Alaska during the winter months and to compile measured wave data during this most severe season. One Waverider buoy was deployed in 500 feet of water, 8 miles south of Yakutat Airport, Alaska during the period November, 1971 to march, 1972. Three-hourly wave height data was transmitted to the National Weather service office at the airport, and was then sent via international weather teletype circuit to the OSI offices in Santa Barbara, California. Attempts were made by OSI meteorologists to forecast and verify offshore wind and wave conditions.

Contractor.—Oceanographic Services, Inc.

Operator.—Exxon Co. USA.

Report.—Wave and Weather Forecast Study, Gulf of Alaska.

Cost.—$38,000.

Participants.—Exxon, Amoco, ARCO, Chevron, Conoco, Gulf, Marathon, Mobil, Shell.

Final report.—July, 1972.

Confidentiality.—Expired.

PROJECT NO. 88

Title.—Kodiak Cost Well.

PROJECT NO. 89

Title.—Kodiak Shelf Geotechnical Soil Boring and Sampling Program.

Purpose and method.—To develop information on the soil and foundation conditions at three COST well locations drilled on the Kodiak Shelf offshore Alaska and to use this information to determine the general characteristics of foundation materials and typical design criteria and parameters.

Initially, the objectives of these investigations were:

(1) To determine the stratigraphy and general physical and engineering characteristics of the foundation materials at the COST well locations; (2) To develop parameters for the axial and lateral load design of piles hypothetically installed at COST well locations, together with pertinent comments concerning pile installation procedures and problems; (3) To determine the suitability of the foundation materials to support a gravity structure including general observations concerning bearing capacity; lateral stability, and cyclic loading effects; and (4) To develop test data and evaluation the effects of possible seismic conditions on structure design.

During the course of this investigation, the scope of the study changed since Boring 2 was not completed and the laboratory cyclic strength tests were not authorized.

Contractor.—McClelland Engineers.

Operator.—Sun Oil Co.

Report.—"Geotechnical Investigation Cost Stratwell Locations, Kodiak Shelf, Alaska".

Cost.—$244,821. Cost to next participant 150 percent of 1/8 of total.

Participants.—Amoco, ARCO, Exxon, Cities, Gulf, Shell, Sun.

Final report.—April 10, 1978.

Confidentiality.—5 years after Kodiak OCS Sale.

PROJECT NO. 90

Title.—St. George Basin COST Well.

Purpose and method.—The objective was to drill a stratigraphic test well to approximately 15,000 feet at a non-productive location. Drilling operations ceased on October 1, 1976 and the rig moved to the Gulf of Alaska.

Contractor.—Ocean Ranger, Drilling Vessel.

Operator.—ARCO.

Report.—None.

Cost.—$14,300,000. No late participants.

Participants.—ARCO, Amoco, Sun, SOCAL, Getty, Gulf Energy Minerals, Exxon, Shell, BP, Texaco, Phillips, Cities Service, CONOCO, Amerada Hess, Tenneco, Skelly, Pennzoil, Union, Marathon, Mobil.

Final report.—Well Completed Oct. 1, 1976.

Confidentiality.—Under the St. George Basin COST Well contract, all material is confidential until after an OCS Sale occurs in the St. George Basin area.

PROJECT NO. 91

Title.—Lower Cook Inlet Ocean Current and Sea Ice Mapping.

Purpose and method.—To characterize ocean currents and sea ice movements in the Lower Cook Inlet Lease Sale Area.

Selected ERTS/Landsat satellite imagery covering the designated area were obtained and analyzed. Seasonal mosaics were constructed from specially enhanced images, and sequential images were used to perform "time lapsed" studies of ice and current movements.

Contractor.—Esca Tech.

Operator.—Marathon.

Report.—Lower Cook Inlet Satellite Current and Ice Evaluation.

Cost.—$16,500—cost to next participant $16,500.

Participants.—Marathon.
Final report.—January, 1977.
Confidentiality.—January, 1982.

PROJECT NO. 92

Title.—Kodiak Shelf Geotechnical Study.

Purpose and method.—To provide a broad overview of the geotechnical conditions on the Kodiak Shelf as pertinent to offshore platform siting and costs.

The study interprets geology of near-surface sediments as a guide to their engineering characteristics. It also maps geological hazards using publicly available information and data from 1975 Shallow Seismic Program conducted by BBN.

Contractor.—Woodward-Clyde Consultants.
Operator.—Shell Oil Co.
Report.—A Broad Overview of Geotechnical Conditions, Proposed OCS Sale No. 46, Kodiak Shelf, Alaska.
Cost and Participation.—This report is offered for sale at a cost of $20,000 per company.
Participants.—Shell.
Completion Date.—November 1976.
Final report.—December 1976.
Confidentiality.—December 31, 1981.

PROJECT NO. 93

Title.—Gulf of Alaska Ground Response Analysis.

Purpose and method.—To assess potential effects of dynamic loadings on structures due to earthquakes.

The study uses oil soil profile date from a soil boring taken in the 1973 ESCI Soil Boring Program. Three dynamic soil models and three bedrock accelograms are selected. Soil response analyses are conducted for seven combinations of accelograms and soil stiffnesses. Cumulative cyclic strains are computed and soil modules deterioration due to remolding is evaluated.

Contractor.—Woodward-Clyde Consultants.
Operator.—Shell Oil Co.
Report.—"Volume I Ground Response Studies—Boring No. 2 Site—Gulf of Alaska", by Woodward-Lundgren and Associates, December, 1974.
"Volume II Ground Response Studies—Boring No. 2 Site—Gulf of Alaska", by Woodward-Clyde Consultants, March, 1975.
Cost.—$26,500.
Participants.—Amoco, ARCO, Chevron, Gulf, Marathon, Mobil, Phillips, Shell, Sun, USGS.
Completion Date.—March 1975.
Confidentiality.—Released by Shell Oil Company to AEIDC on June 22, 1981.

PROJECT NO. 94

Title.—Beaufort Sea Breakup Ice Movement Study—1979.

Purpose and method.—Breakup ice movement will be measured using a marine radar tracking system based on Narwhal Island. Prior to breakup, on about 1 June, ten (10) passive radar reflectors mounted on 30-foot tripods will be installed in an array determined by the participants, within 10 miles of Narwhal Island. The movement of the tripods and prominent natural ice features during and after breakup will be recorded on the radar screen using time-lapse photography.

General ice conditions will be documented during regularly scheduled helicoptor service flights. This information will be supplemented by time-lapse photography of ice conditions immediately inside and outside the islands. Weather conditions will be recorded for use in analyzing recorded ice movements.

Data analysis will include annotation of the time-lapse films and determination of representative movement rates and direction. Major movements will be compared to local wind conditions.

Contractor.—Oceanographic Services, Inc.
Operator.—None
Report.—Final report, 35mm slides, time-lapse movies, and magnetic data tape.
Cost.—$128,719. Cost to next participant: $18,338 plus $10,000 late fee.
Participants.—ARCO, Chevron, Exxon, Phillips, Shell, Sohio.
Final report.—April 1980.
Confidentiality.—April 1, 1985.

PROJECT NO. 95

Title.—Summary analysis of 1974-75 Beaufort Sea Aerial Photography.

Purpose and method.—Summarize the 1974-75 Prudhoe Bay sea ice aerial photography obtained by Amoco Production Company, as part of Project No. 28, and present in the same format adopted in Project No. 53, Beaufort Sea Ice Movement Studies 3-year Summary and Analysis. This will facilitate the comparison of the 1974-75 ice conditions with those of subsequent years.

Project No. 28 is a prerequisite to participation in this study. Project No. 53 contains summaries of aerial photography for the years 1975-76, 1976-77 and 1977-78, and is not a prerequisite for this project.

Contractor.—Oceanographic Service, Inc.

Operator.—None.

Cost.—Total cost $15,373. Cost to next participant—$4,063, plus participation in Project No. 28.

Report.—Summary Analysis of 1974-75 Beaufort Sea Aerial Photography.

Participants.—Amoco, Exxon, Shell, Socal, Sohio.

Final report.—March, 1980,

Confidentiality.—August 1, 1984.

PROJECT NO. 96

Title.—Model Tests and Analysis of Multiyear Pressure Ridges Failing Against a 45° Cone.

Purpose and method.—To measure the forces on a 45° cone generated by model multiyear pressure ridges and to determine the mode of ridge failure, the effect of ridge size, length and the ice sheet thickness and to develop a mathematical model to predict ridge loads on cones.

Model tests of multiyear pressure ridges moving against a 45° conical structure were performed in ARCTEC's model ice test basin in Montreal, Canada. A total of 50 ridges were tested with the ridge axis being either parallel, perpendicular, or 45° to the direction of motion. Horizontal and vertical ridge forces on the cone were recorded. The mechanical properties of the ridge and those of the surrounding ice sheet were also measured.

A nonlinear mathematical model was developed to predict multiyear ridge forces on cones. This model assumes the ice to be elastic/perfectly plastic and uses the upper bound technique of plastic limit analysis. The required material properties were the flexural strengths of the ridge and the ice sheet, and the coefficient of friction between the model ice and the cone surface.

Contractor.—ARCTEC Canada Limited (model tests).

Operator.—Exxon Production Research Co.

Reports.—A. Modelling the Interaction Between Pressure Ridges and Conical Structures (Assessment of the Effects of Ridge Length, Ice Cover Depth and Angle of Encounter), Arctec Canada Report No. 193-C, by Edwards, N.Y. and Abdelnour, R., February 15, 1977.

B. A 16-mm movie film lasting approximately 100 minutes and illustrating model testing conducting for EPR in Montreal, Canada during September and October 1976 from which data for the above report was generated.

C. Analysis of Model Tests of Pressure Ridges Failing Against Conical Structures, EPRCo report by Wang, Y.S.

Cost.—$30,000 for each participant.

Participants.—Exxon.

Final report.—November, 1979.

Confidentiality.—June 1, 1983.

PROJECT NO. 97

Title.—Sonar Ice Mapping System (SIMS)—The Development and the 1977-78 Measurement Program.

Purpose and method.—To develop a self-contained sonar ice-mapping system suitable for unattended subsea profiling of Bering Sea ice. The prototype system was developed, field tested, and subsequently deployed in Norton Sound from September 1977 to July 1978.

The SIMS development phase was started with the design and fabrication of three prototype units, making maximum use of proven subsystems. The profiling systems consists of a 200 KHz acoustic release, a 10 KHz locating beacon and the necessary battery packs.

Three SIMS units were deployed in September 1977 approximately 11 miles southwest of Sledge Island, Norton Sound. The systems operated unattended until recovery in July, 1978. Data from the three units were processed to yield profiles of the underside of the ice. The profiles were analyzed to determine monthly frequency distributions of ice keel depths.

Contractor.—Oceanographic Services, Inc.

Operator.—Exxon Production Research Co.

Report.—A series of five progress and data reports and the data tapes.

Cost.—$30,000 plus $100 (approximately) reproduction costs per set of reports. (Total license fees in excess of $120,000 will be divided equally among licensees).

Participants.—Exxon.

Final report.—Complete.

Confidentiality.—June 1, 1984.

PROJECT NO. 98

Title.—Feasibility Study of an Air Cushion Drilling System for Shallow Water Areas of the North Slope of Alaska.

Purpose and method.—To evaluate the capability of heavy lift air cushion platform to support exploration drilling activities in shallow waters near Prudhoe Bay off Alaska's North Slope.

The study consists of three major elements which comprise the air cushion drilling system, the air cushion drilling platform (ACDP), the ice defense system, and the logic support system for year-round operation. The ACDP in its drilling mode can be either floating or on an intermediate structure. The ACDP is isolated from direct contact with the ice by an open water (moat). The ice defense system consists of components required to establish and maintain the ice free moat around the ACDP. The logic support system considers the various mix of conventional land vehicles, aircrafts, and air cushion transports required to maintain year-round operation.

Technical descriptions, including drawings of the air cushion drilling platforms, air cushion support platforms, and support systems are included. Operational descriptions of the capability of the ACDS to various drilling, movings, and contingency scenarios are presented. Cost estimates for several methods of operation are also included.

Contractors.—Global Marine Developments, Inc.

Operator.—Exxon Production Research Co.

Report.—Feasibility Study—Air Cushion Drilling System for the Shallow Water Areas of the North Slope of Alaska (plus ancillary drawings).

Cost.—$25,000.

Participants.—ARCO, Exxon.

Final report.—Completed.

Confidentiality.—March 6, 1982.

PROJECT NO. 99

Title.—Yukon Delta Tide Gauge Program 1979.

Purpose and method.—To measure storm tide surges near rubble piles in the Norton Sound and Northern Bering Sea.

Two retrievable Aanderaa Model WRL-5 tide gauges were placed near instrumental rubble piles in the Norton Sound and Northern Bering Sea prior to the 1979 breakup.

Contractor.—Oceangraphic Services, Inc.

Operator.—None.

Report.—Study in progress.

Cost.—$60,674. Cost to next participant: $19,000.

Participation.—Exxon.

Final report.—Spring, 1980.

Confidentiality.—One year after first lease sale in area or consent of n-1 participants.

PROJECT NO. 100

Title.—Beaufort Sea Geotechnical Interpretation, Supplemental Study.

Purpose and method.—Project No. 48 is updated to incorporate data from the 1979 USGS soil boring program in the Beaufort Sea. Conclusions relating to soil distribution, soil strength and consolidation characteristics and permafrost distribution are revised. A discussion of gravel source locations is included.

Contractor.—Harding-Lawson Associates, Inc.

Operator.—None.

Report.—Interpretation of Geophysical, Geologic and Engineering Data, Beaufort Seal, Alaska, Supplemental Study.

Cost.—Total cost is $39,700. Cost to next participant is approximately $6,000 (not including required purchase of project No. 48).

Participants.—Shell, Arco, Chevron, Exxon, Getty, Mobil, Marathon, Gulf.

Final report.—Dated November, 1979.

Confidentiality.—November, 1984.

PROJECT NO. 101

Title.—Norton Sound Geotechnical Interpretation Study.

Purpose and method.—An interpretation of publicly available geophysical and geotechnical data was made. Soil distribution and character, faulting, seismicity, gas-charged sediments and ice gouging are discussed for Norton Sound. Recommendations for further investigation are given.

Contractor.—Harding-Lawson Associates, Inc.

Operator.—None.

Report.—Interpretation Study of Geotechnical Data, Norton Basin, Alaska.

Cost.—Total cost is $116,400. Cost to next participant is approximately $22,000.

Participants.—Shell, Chevron, Getty, Gulf, Marathon and Mobil.

Final report.—Dated April, 1980.

Confidentiality.—April, 1985.

PROJECT NO. 102

Title.—Beaufort Sea Freeze-Up Movement Study—1979.

Purpose and method.—To obtain ice movement data in the nearshore Beaufort Sea during the freeze-up period from October to December.

Data are collected using a marine radar tracking system on Narwhal Island. Twenty passive radar reflectors are deployed inside and outside of the barrier islands within six miles of the tracking station. Time lapse photography records images of the radar screen. These data are supplemented by time-lapse cameras recording ice conditions near Narwhal and hand-held aerial photographs during system service trips. Data analysis includes overlaying successive radar images to obtain movement vectors and rates.

Contractor.—Oceanographic Services, Inc.

Operator.—None.

Report.—Analysis of 1980 Beaufort Sea freeze-up movement data.

Cost.—$165,000. Cost to next participant—$37,500.

Participants.—ARCO, Exxon, Phillips, Shell, SOCAL.

Completion date.—February, 1980.

Final report.—August, 1980.

Confidentiality.—September 1, 1985.

PROJECT NO. 103

Title.—OSI Stress Sensor Study.

Purpose and method.—The project provides a state of the art ice stress sensor report, including the theory and practice for measuring stresses in ice. The report also evaluates previous ice stress sensors specifically designed for use on ice and discusses in detail the theory and design of cylindrical stress sensors.

Contractor.—Oceanographic Services, Inc. (OSI), Santa Barbara, California.

Report.—Stress Sensor Theory and Evaluation, January, 1980.

Cost.—$10,000 fixed fee per participant.

Participants.—Arco, Gulf, Shell.

Confidentiality.—Indefinite—report copyrighted by OSI.

PROJECT NO. 104

Title.—Beaufort Sea Oceanographic Measurement Program, 1979.

Purpose and method.—To measure waves, currents, and tides at one site in the Beaufort Sea. Measurements were taken from mid August to early October at a site in approximately 45 feet of water north of Reindeer Island. Wave spectra and time histories of tide and surge were calculated from a bottommounted pressure sensor. Current speed and direction were obtained from a SeaTrak Savonius Rotor-Type Current Meter.

Contractor.—Oceanographic Services, Inc.

Operator.—None.

Report.—Beaufort Sea Oceanographic Measurement Program, 12 August-8 October 1979.

Cost.—Report may be purchased at a cost of $45,000.

Participants.—Arco, Exxon, Shell.

Final report.—April, 1980.

Confidentiality.—April, 1990.

PROJECT NO. 105

Title.—Seismicity of Offshore Alaska Regions (SOAR) Program.

Purpose and method.—In March, 1978, Exxon Production Research Co. (ERPCo.) formally initiated an earthquake measurement research program, Seismicity of Offshore Alaska Regions (SOAR) with the University of Texas' Marine Science Institute (UT-MSI). The program is being conducted in two phases. The immediate objective of Phase I was to develop a strong motion, ocean bottom seismometer (SM-OBS) capable of accurately measuring intense ground shaking. The focus of the effort was to engineer a system so that the cost, size, and weight of individual instruments facilitate the deployment and recovery of large numbers of stations with modest offshore effort. The Phase II effort consists of maintaining eight of the strong motion instruments offshore Kodiak Island for approximately one year. The program offered provides detailed documentation of the development, testing, and analysis of the SM-OBS (Phase I) and documentation of a limited data gathering operation along with any data collected (Phase II).

Phase I included development and testing of the instrumentation and other associated hardware; construction of three instruments; and experimental and analytical work on the soil-instrument coupling. This phase culminated in a limited field test where three sensors were deployed off Kodiak Island and successfully recovered after one month on bottom. An overview of this work is documented in the 1979 OTC paper 3615, "Soil Coupling of a Strong Motion, Ocean Bottom Seismometer."

Phase II includes modification and construction of additional five SM-OBS's; development of a preload system to insure the instruments are well seated on the bottom; and deployment and operation of eight sensors offshore Kodiak Island, Alaska for approximately one year (June 1979–June 1980). The offshore deployment and recovery is being conducted from NOAA vessels. In addition , Phase II includes an EPR/UT-MSI/University of Alaska Program in which three strong motion stations were installed on nearby land sites around Kodiak during the summer of 1979.

Contractor.—Exxon Production Research Co., P.O. Box 2189, Houston, Tex. 77001. Attention: Mr. J. A. Rickard.

Operator.—None.

Report.—Phase I Report. Phase II Report includes a special report describing the instrument preload system and copies of all uncorrected ground motion measurement made.

Participants.—Exxon, Chevron, ARCO, Mobil and Shell.

Cost.—$50,000/Participant; Closing date without penalty is February 1, 1980.

Final reports.—Fall 1980.

Confidentiality.—As per Agreement between Exxon Production Research and participant. Proposed Agreement available upon request.

PROJECT NO. 106

Title.—Arctic Cone Test Structure—Phase I.

Purpose and method.—To evaluate the feasibility of constructing and installing in the Arctic a conical test structure to measure ice forces.

The study examines test structures applicable to the 20 to 60 foot water depth range in the Beaufort and Chukchi Seas. Phase I includes site selection, preliminary structural design, ice and wave load calculations, preliminary design of instrumentation system, identification of potential construction sites, project timing, and estimated test program costs.

Contractor.—Brian Watt Associates, Inc. and Evans-Hamilton, Inc.

Operator.—Shell Oil Co.

Report.—Report on feasibility, preliminary design and costs of an Arctic cone test structure and associated instrumentation system.

Cost.—$213,000. Cost to next participant—$36,000.

Participants.—ARCO, Exxon, Mobil, Phillips, Shell, SOCAL, Sohio.

Completion date.—March, 1980.

Final report.—March, 1980.

Confidentiality.—September 2, 1985.

PROJECT NO. 107

Title.—Large-Scale Ice Strength Tests and Small-Scale Ice Strength Laboratory Tests.

Purpose and method.—The purpose of this project is to measure the large-scale, unconfined compresssive strength of sea ice at various strain rates and different c-axis orientations, and to conduct small-scale laboratory tests at the temperature, strain rate, and c-axis orientation of the large scale tests. These data provide a comparison between large and small scale ice strengths for the same type of natural sea ice. Ten ice blocks of dimension, 10ft x 20ft and of full thickness of natural ice sheet, were tested near Prudhoe Bay during January-April, 1980. Ice samples were collected at these locations and shipped to the EPR cold room for subsequent small-scale strength tests.

Contractor.—ARCTEC, Inc.

Operator.—Exxon Production Research Co.

Report.—The report will be divided into two parts; namely, Large-Scale Ice Strength Tests and Small-Scale Ice Strength Tests.

Cost and participation.—Approximately $1,420,000 with five participants. Cost to the next participant is $355,000.

Participants.—Exxon, Shell, Sohio, ARCO, Chevron.

Final reports.—Large-Scale Ice Strength Tests—December, 1980. Small-Scale Ice Strength Tests—June, 1981.

Confidentiality.—December 31, 1983.

PROJECT NO. 108

Title.—Beaufort Sea Ice Movement Study, 1979-80.

Purpose and method.—To measure the rate and extent of ice movement at three locations of the Beaufort Sea barrier islands. The stations have been located in water depths less than 40 feet, a zone in which little data have been obtained previously. Station 1 is located 1.75 n. miles east of Cross Island. The water depth here is 30 feet. Station 2 is 2.75 n. miles west-northwest of the west end of Pole Island in 25 feet of water. The last station is 2 n. miles northwest of the west end of Narwhal Island in 25 feet of water.

Ice movement will be measured with a mechanical reel system. Data will be recorded on magnetic tape at the sites and also telemetered to a base station located in the Prudhoe Bay area. In addition to ice movement data, winds, temperature, and barometric pressure will be measured at selected stations.

Contractor.—Oceanographic Services, Inc.

Cost.—Cost to next participant is $70,000.

Report.—Beaufort Sea Ice Movement Study, 1979-1980.

Participants.—Exxon.

Completion date.—November, 1980.

Confidentiality.—Unlimited.

Background.—Similar ice movement programs have been conducted during the previous four winters (AOGA projects 27, 39, 42 and 52). These programs gathered significant information concerning the magnitude and rate of ice movements along with prevailing environmental conditions.

Participation in previous programs is not a prerequisite for joining the 1979-80 program. Those desiring to receive copies of the previous data may do so by entering into the appropriate contract with Amoco Production Company or Oceanographic Services, Inc.

PROJECT NO. 109

Title.—Level Ice and Pressure Ridge Characteristics During USCGC Polar Star Deployment in Bering and Chukchi Seas.

Purpose and method.—To determine ridging geometrics prevalent in the Bering and Chukchi Seas using the icebreaker POLAR STAR as a logistics base. In addition to ridging geometrics, ice ridge forces on the vessel will be measured along with an investigation of internal ridge characteristics. Level ice thicknesses and core samples will also be collected. The results of this study should provide information pertinent to marine transportation, ice forces on floating structures, and statistics on ice ridging intensity and underwater geometry.

Contractor.—ARCTEC. Inc., 9104 Red Branch Road, Columbia, Maryland 21045.

Operator.—None.

Report.—Final Report August, 1980.

Cost.—$140,000. Cost to next participant $21,975.

Participants.—Amoco, ARCO, Chevron, Exxon, Getty, Gulf, Mobil, Phillips, Shell.
Confidentiality.—Indefinite.

PROJECT NO. 110

Title.—Aerial Mapping of Sea Ice in the Bering Sea (AMSIBS) 1980.

Purpose and method.—To obtain and analyze 1,800 miles of stereo aerial photography of sea ice in the Norton Sound and Bering Sea. Six hundred miles of photography will be gathered in mid-January, late February and early April. Flight line photos will be reviewed and selected intervals visually analyzed to determine average floe size, percent open water, significant ridge height, ridging frequency and the preferred orientation of leads and ridges. Ice maps will be prepared by an experienced ice observer from his observations during the flights. As part of this program, Bering Sea ice conditions during the entire 1979-1980 ice season will be documented and analyzed. These data will be extracted from satellite imagery.

This project is a continuation of previous studies including Project No. 64 (1977), No. 43 (1978) and No. 51 (1979). Joinder of these studies is not a prerequisite to participation in No. 110.

Contractor.—Oceanographic Services, Inc.

Operator.—None.

Cost.—Total estimated cost of $195,579. Cost to next participant is estimated at $59,115.

Participants.—Amoco, ARCO, Exxon, Phillips and Shell.

Final report.—Draft report to be issued in early 1981.

Confidentiality.—January 1, 1986.

PROJECT NO. 111

Title.—Aerial Mapping of Sea Ice in the Chukchi Sea, 1980.

Purpose and method.—To analyze 2,400 miles of stereo aerial photography of sea ice in the Chukchi Sea obtained during two overflights. To fly a reconnaissance flight in January 1980 to obtain general ice conditions in the same area. Visual analyses will be performed at 10 mile intervals to determine the amount of open water, floe size, ridge heights, and ridging frequency on a subset of the data. Further analyses, including digitizing, profiling and computation of statistics will be performed on a smaller subset.

Contractor.—Oceanographic Services, Inc.

Operator.—None.

Report.—Aerial Mapping of Sea Ice in the Chukchi Sea 1980.

Cost.—$195,579. Cost to next participant: $52,185.

Participants.—ARCO Oil & Gas Co., Exxon, U.S.A., Gulf, Mobil, Shell.

Final report.—March, 1981.

Confidentiality.—January 1, 1986.

PROJECT NO. 112

Title. Bering Sea Ice Features Investigation—1980.

Purpose and method.—To investigate the origin, movement, physical characteristics and overall distribution of large pieces of consolidated ice rubble found in Norton Sound and the Northern Bering Sea.

Large ice rubble piles were previously observed as a part of Norton Sound aerial photographic programs conducted by OSI during the 1976-1977 and 1977-1978 program

The program will begin with reconnaissance flights in the Norton Sound area to monitor the appearance of the rubble piles. Once they appear, the following programs will be initiated: precision aerial photography; field measurements; time lapse photography for recording breakup of the rubble piles; the deployment of satellite positioning buoys to determine movement; and reconnaissance flights to monitor the rubble piles during ice breakup

This study is a continuation of previous studies on rubble pile data; Project #47, Yukon Delta Rubble Pile Investigation, 1978 and Project #54, Norton Sound and Northern Bering Sea Rubble Pile Investigation, 1978-79. Joinder of those studies is not a prerequisite to participate in this project.

Contractor.—Oceanographic Services, Inc.

Operator.—None

Report.—Bering Sea Ice Features Investigation—1980.

Cost.—$138,142. Cost to next participant $38,024

Participants.—Amoco, ARCO, Chevron, Mobil and Sohio.

Final report.—September 1980.
Confidentiality.—September 1, 1985.

PROJECT NO. 113

Title. Conical Structure Test Program, 1979–80.

Purpose and method.—To investigate the interaction of a conical structure with thick ice ridges of various lengths. Seven ridges with thicknesses up to 4 ft were tested. Ridge lengths varied from 22 to 90 ft. The conical structure was a 30°cone with a waterline diameter of about 12 ft. A previous program, Project No. 61, used this structure for tests with ice ridges up to 2 ft thick and with ice rubble.

Contractor.—Esso Resources Canada Limited.

Operator.—Exxon Production Research Co.

Report.—Conical Structure Test Program Winter 1979–80.

Cost.—Approximately $280,000. Cost to next participant is $70,000. Funds contributed by participants in excess of program costs will be distributed equally to participants.

Participants.—Exxon, Chevron, Shell, ARCO and Mobil.

Final report.—November, 1980.

Confidentiality.—February 1, 1985.

PROJECT NO. 114

Title. Ice Stress Sensor Verification.

Purpose and method.—OSI has developed an inexpensive ice stress sensor. The OSI ice stress sensor has been successfully tested in the laboratory under uniaxial loading conditions.

Phase I.—The OSI ice stress sensor will be tested in natural sea ice under different biaxial loading conditions. A series of twenty tests are planned to evaluate the gauges response to various load ratios and loading rates in sea ice having different crystal sizes. The tests will be conducted off West Dock in Prudhoe Bay during March 1980.

Phase II.—The participants have the options at the conclusion of Phase I top test the entire stress measurement system by installing two stress measurement stations near the West Dock. Each station will consist of three gauges in a triad arrangement oriented at 0°, 45° and 90° to a reference direction.

Contractor.—Oceanographic Services, Inc.

Operator.—None.

Report.—Beaufort Sea Ice Stress Study.

Cost.—Total estimated cost of $167,404. Cost to next participant is estimated at $41,915.

Participants.—ARCO, Chevron, Mobil, Phillips, Shell and Sohio.

Final report.—Estimated 12/80.

Confidentiality.—January 1, 1987

PROJECT NO. 115

Title.—Geotechnical Considerations of St. George Basin, Offshore Alaska, Proposed OCS Lease Sale Area No. 70.

Purpose and method.—To determine the general nature, extent, and geotechnical properties of shallow soils and to identify the types of shallow geologic features and conditions that can affect petroleum exploration or design or siting of production platforms and pipelines.

Information used will be existing geotechnical and high resolution geophysical data including data from a McClelland survey in 1975, rock samples and seismic data in the public domain and pertinent scientific and engineering literature.

Contractor.—McClelland Engineers, Inc.

Operator.—None.

Cost.—Fixed Fee—Cost to next participant is $35,000.

Participants.—Amoco, ARCO, Chevron, Exxon, Marathon, Mobil.

Final report.—Completed by July 31, 1980.

Confidentiality.—Unlimited, no provisions for release.

PROJECT NO. 116

Title.—Bowhead Whale Study.

PROJECT NO. 117

Title.—Sea Ice Conditions Along the North Slope of Alaska, Cape Halkett to Flaxman Island, June through October 1976, 1977, 1978.

Purpose and method.—The study continues and expands a previous study by Sea Ice Consultants on Beaufort Sea ice conditions 1953 through 1975, AOGA Project No. 35. In addition to using the data format used in AOGA 35, the present study discussed belts and patches of ice which sometimes persist offshore of the Barrier Islands. The study also discussed methods used by ice observers in recording ice conditions.

Contractor.—Sea Ice Consultants (Then, a Division of Global Weather Dynamics, Inc.).

Operator.—Shell Development Company, Bellaire Research Center. License Information: Patents and Licensing Division, Shell Development Co., Box 2463, Houston, Tex. 77001.

Reports.—About 400 pages of text, maps, tables, charts, and graphs by the above title.

Cost.—Fixed license fee to Shell: $5,000.00 Copy cost for reproduction to Sea Ice Consultants: no more than $150.00 per copy.

Final Report.—June, 1979.

Confidentiality.—April, 1990.

PROJECT NO. 118

Title.—Beaufort Sea Breakup Study—1980.

Purpose and method.—Breakup ice movement will be measured using a marine radar tracking system based on Narwhal Island. Prior to breakup, on or about 15 June, twenty (20) passive radar reflectors mounted on 30-foot tripods will be installed in an array determined by the Participants, within 10 miles of Narwhal Island. The movement of the tripods and prominent natural ice features during and after breakup will be recorded on the radar screen using time-lapse photography.

General ice conditions and occurrences of ride-up and pile-up along the barrier islands and the mainland will be documented during regularly scheduled aerial reconnaissance flights along predetermined flight paths. This information will be supplemented by time-lapse photography of ice conditions immediately inside and outside the islands. Weather conditions will be recorded for use in analyzing recorded ice movements.

Analysis of the data will consist of digitizing the positions of natural and manmade targets from enlarged successive photographic images of the radar screen. These data will be used to calculate movement rates and generate movement plots. Supplementary photographic and weather data will be used to prepare a scenario of breakup ice movement events.

Contractor.—Oceanographic Services, Inc.

Operator.—None.

Report.—Final report, plus 35mm slides, time-lapse movies and magnetic data tape.

Cost.—$248,677. Cost to next participant—$31,085 plus $25,000 late participants fee.

Participants.—Amoco, ARCO, Chevron, Exxon, Phillips, Shell, and Sohio.

Final report.—Due January, 1981.

Confidentiality.—February 1, 1986.

PROJECT NO. 119

Title.—Beaufort Sea Oceanographic Measurement Program, 1980.

Purpose and method.—To measure waves, currents and tides at five locations in the Beaufort Sea, and wind, barometric pressure and temperature at Narwhal Island. Surge gauges will be installed at four locations. Measurements will be taken from late August to October at four instrument locations, and into November at one location.

Contractor.—Oceanographic Services, Inc.

Operator.—None.

Report.—The report will be issued in two parts; Part I—Measurements August and September and Part II—Measurements October and November.

Cost.—Total cost approximately $424,000. Cost to next participant is approximately $105,700.

Participant.—Shell, Arco, Amoco, Chevron, Exxon.

Final report.—January, 1981 (part I).

Confidentiality.—July, 1990.

PROJECT NO. 120

Title.—Acquisition and Interpretation of SLAR Ice Imagery in the Prudhoe Bay Area.

Purpose and method.—To obtain Side Looking Airborne Radar (SLAR) imagery products from Point Barrow to the Canadian boarder and from the Alaskan coast to a distance 150 km offshore. A total of 10 flights will be flown during the 1980 break-up period to obtain ice feature size and movement. Two special missions will be flown with sterophotography equipment to correlate with the SLAR imagery.

Contractor.—F. G. Bercha & Associates, Ltd.

Operator.—None.

Cost.—Total cost $250,000. Cost to next participant—$67,000.

Participant.—ARCO, Exxon, Mobil, Phillips, Sohio.

Final report.—Draft report issued in December, 1980.

Confidentiality.—June, 1985.

PROJECT NO. 121

Title.—Preliminary Design of an Arctic Cone Test Structure with Indirect Load Measurement.

Purpose and method.—To investigate the feasibility, preliminary design, and cost of an Arctic cone test structure without the requirement for direct measurement of total forces. The study will review and revise criteria established in Project #106 (Arctic Cone Test Structure—Phase I), develop conceptual designs for a concrete and for a steel structure, investigate instrumentation requirements, and develop an overall cost plan.

Contractor.—Brian Watt Associates, Inc.

Operator.—None.

Report.—Final report documenting design, costs, and other findings.

Cost.—$148,000. Cost to next participant is approximately $27,000. Paticipation in Project No. 106 is required in order to participate in Project No. 121.

Participant.—Arco, Chevron, Exxon, Gulf, Mobil, Phillips, Shell, Sohio.

PROJECT NO. 122

Title.—Offshore Alaska Seismic Measurement Program.

Purpose and method.—To measure ocean bottom, strong motion due to earthquakes in Alaskan OCS waters. Ten ocean bottom strong motion seismometers (OBS) were deployed north and south of the Alaska Peninsula in July and September, 1980, and recovered in June, 1981. A second deployment of ten or more OBS is planned for June, 1981 with recovery in June, 1982.

Contractor.—Marine Science Institute—University of Texas.

Operator.—No industry operator; the project is being conducted in cooperation with NOAA-OCSEAP.

Report.—Raw data with preliminary analysis will be distributed to participants and NOAA.

Cost.—$555,528.

Participants.—Shell, ARCO, Chevron, Exxon, Mobil.

Confidentiality.—None.

PROJECT NO. 123

Title.—1981 Level Ice and Pressure Ridge Characteristics in Bering/Chukchi/Beaufort Seas During Deployment of USCGC POLAR SEA.

Purpose and method.—To determine level ice properties and pressure ridge geometries in the Bering/Chukchi/Beaufort Seas during the February, March, and April 1981 deployment of the Coast Guard icebreaker POLAR SEA. Power requirements of the vessel to penetrate measured pressure ridges will also be measured. The results of this study will provide data for marine transportation studies and ice force predictions on offshore structures, and statistics on pressure ridge frequency and severity. An interesting aspect of the pressure ridge studies will be underwater photography of ridge keels.

Contractor.—ARCTEC, Inc., 9104 Red Branch Road, Columbia, Maryland 21045 (301) 730-1030.

Operator.—None.

Report.—August, 1981.

Cost.—$364,100. Cost to next participant $30,341 plus a late fee of 50 percent of previously-invoiced amounts.

Participants.—Amoco, ARCO, Chevron, Conoco, Exxon, Getty, Gulf, Mobil, Phillips, Shell, and Sohio.

Confidentiality.—August, 1986.

PROJECT NO. 124

Title.—Beaufort Sea Multi-year Ice Ridges and Land-fast Ice Crystal Orientation.

Purpose and method.—During March, 1978, Gulf Research and Development Company and Gulf Canada Ltd conducted two independent in-situ ice studies offshore Prudhoe Bay, Alaska. Gulf Canada performed a multi-year pressure ridge project to obtain geometry and property measurements that can be used to develop ice loading conditions. Sonal profiling and standard surveying techniques were employed to determine sail and keel measurement, in-situ borehold jack measurements, and ice core tests provided multiyear ice property parameters, such as flexural and compressive strengths, apparent elastic moduli, temperature, and salinity. Gulf Research and Development Company conducted a nearshore study in Prudhoe Bay to determine the crystal orientation of the ice sheet and its effect on flexural and crushing strength of sea ice. Small-scale specimens were prepared both perpendicular and parallel to the mean crystal orientation and tested in a load test frame. In addition to comparative strength results, ice sheet property measurement, such as temperature, salinity, density, and borehold jack profiles were obtained.

Contractor and operator.—Gulf Research and Development Co., P.O. Box 36506. Houston, Tex. 77036.

Report.—(1) Geometry and Strength of Multi-year Pressure Ridges in the Alaskan Beaufort Sea. (2) Crystal Orientation of Fat Ice in Prudhoe Bay, Alaska and its Effects on Sea Ice Flexural and Crushing Strength.

Cost.—$12,000 per participant.

Participants.—Chevron, Exxon, Mobil, Shell.

Final report.—May, 1979.

Confidentiality.—January 1, 1984.

PROJECT NO. 125

Title.—Ice Pressure Measurement Technology.

Purpose and methods.—A Pressure Sensing Apparatus and certain Technology relating to the measurement of ice pressure forces on artificial structures has been developed. The Pressure Sending Apparatus is protected by United States Patent No. 4,175,445. A report has been prepared which includes the description of the ice pressure sensor, and explanation of the measurement philosophy from which the senor design was developed and a discussion of the use of such senors in field ice measurement programs.

Operator.—Exxon Production Research Co., P.O. Box 2189, Houston, Tex. 77001.

Report.—Technology for Ice Pressure Measurement.

Cost.—An initial royalty of $100,000 upon entering the license agreement, plus an additional royalty of $1,000 for each Licensed Apparatus which the licensee constructs or has constructed. EPR will conduct a three-day technical seminar for all licensees at no cost. Thereafter, if the licensee requires further assistance, EPR will provide up to 40 man-hours of additional technical assistance at its standard rates plus associated expenses.

Participants.—Exxon.

Final report.—September, 1981.

Confidentiality.—15 years.

PROJECT NO. 126

Title.—Slope Protection Design Development for Beaufort Sea Islands.

Purpose and method.—To develop shore protection schemes that will optimize overall gravel island costs while providing protection against impinging waves and ice. Tetra Tech is responsible for wave analysis. The study uses three gravel island cases: 1. An exploratory island in 40 feet of water. 2. A production island in 20 feet of water and 3. A production island in 40 feet of water. "Typical" environmental conditions and service requirement expected in the Beaufort Sea are used to design the slope protection concepts. Both wave and ice testing of the developed concepts are performed.

Contractor.—Tetra Tech Inc., 620 North Rosemead Blvd., Pasadena, Calif. 91107.

Operator.—None.

Cost.—Gross Cost $254,360. Cost to next participant is estimated at $48,124.

Participants.—Amoco, ARCO, Chevron, Conoco, Dome, Exxon, Mobil, Phillips, Shell, Sohio.

Final report.—Estimated September 1, 1981.

Confidentiality.—September 1, 1985.

PROJECT NO. 127

Title.—Bering/Chukchi Seas Ice Concentration Study.

Purpose and method.—The purpose of this study is to provide a detailed data base and statistical description of sea ice coverage and concentration in the Bering and Chukchi Sea. Historical data on concentration of all ice, multiyear ice, young ice, and floe size are compiled for 71 sites on a weekly basis from 1966 through 1979. Data sources include ice maps, satellite imagery, aerial reconnaissance and ship reports. The compiled data are analyzed to provide statistical descritptions in a format useful for planning offshore operations.

Contractors.—Sea Ice Consultant (SIC) & Shell Development Co.

Operator.—Shell Development Co.

Report.—(1) Report by SIC on ice concentration data and coverage. (2) Report by Shell on Statistical analysis.

Cost.—$25,000 per original participant; $30,000 to next participant.

Participants.—Amoco, ARCO, Chevron, Exxon, Gulf, Mobil, Sohio.

Final report.—Estimated April 1981.

Confidentiality.—April 1986.

PROJECT NO. 128

Title.—Speed and Ice Depth Sonar (SIDS) Project.

Purpose and method.—Develop acoustic instrumentation for measuring ice velocity and ridge keel profiles at remote arctic offshore locations. Install three units offshore Prudhoe Bay in 60 to 125 feet of water during the spring of 1981.

An upward-looking sonar will measure ice depth and record it internally whenever a change of three feet is detected. Sampling rate will vary with ice speed. Ice speed will be measured in two orthogonal directions by doppler sonar once every eight minutes. A compass and tilt sensor will measure the orientation of the instrumentation. A call up buoy will be used for package recovery.

Contractor.—Polar Research Laboratory, Inc., Santa Barbara, Calif.

Operator.—Shell Oil Co.

Reports.—To be issued upon completion.

Cost and participation.—Total programs: $375,000. As of April, 1981, 8 companies participating: Shell, ARCO, Chevron, Cities, Exxon, Mobil, Phillips, Sohio.

Final report.—Late 1981.

Confidentiality.—Until August 15, 1985.

PROJECT NO. 129

Title.—1980 Freezeup Study of Barrier Island and Harrison Bay.

Purpose and method.—To monitor ice rideup, ice pileup, and storm surge along the Alaskan Beaufort coast from Flaxman Island to Cape Halkett. Four field trips are planned in two or three-week intervals from September to November. During each of these trips, helicopter reconnaissance will be conducted, and interesting ice rideup and pileup features will be visited, documented, and photographed. On the first trip 6-8 storm surge gages will be installed in the study area.

Contractor.—Vaudrey & Associates, Inc., 3030 Bonney Briar Drive, Missouri City, Tex. 77459 (713) 437-3146.

Operator.—None.

Report.—February, 1981.

Cost.—$58,820. Cost to next participant $5,347, plus late fee of 50% of previously invoiced amounts.

Participants.—Amoco, ARCO, Chevron, Conoco, Exxon, Gulf, Mobil, Phillips, Shell, Sohio.

Confidentiality.—February 1986.

PROJECT NO. 130

Title.—1980/81 Large Scale Ice Strength Tests.

Purpose and method.—To determine the strength of ice as a function of the strain rate, the direction of loading with respect to c-axis, the temperature and the salinity. The tests results would be useful to design of exploration and production platforms in the Arctic Ocean.

Total of 13 tests are planned to be conducted near the Prudhoe Bay area from February, 1981 through May, 1981. Three different types of tests will be conducted:

1. *Indentation Test:* To apply an inplane load to the edge of a floating ice sheet to determine the indentation factor.
2. *Fact Strain Rate Uniaxial Compression/Winter Ice Test:* To compress ice blocks cut free from the ice sheet to determine the stress required to fail the ice blocks at fast strain rates (from 10-5 to 10-3 sec-1).
3. *Fast Strain Rate Uniaxial Compression/Warm Ice Test:* To compress artificially warmed ice blocks to determine the stress required to fail the ice blocks at fast strain rates (from 10-4 to 10-3 sec-1).

Ice samples will be collected at the test site for small scale laboratory testing.

Contractor.—ARCTEC, Inc., Columbia, Md.

Operator.—Exxon Production Research Co., P.O. Box 2189, Houston, Tex. 77001.

Report.—There will be separate reports for the large scale field tests and for the small scale laboratory tests.

Cost.—$257,857 per participants for the seven original participants and $322,321 for each additional participant.

Participants.—Exxon, ARCO, Mobil, Sohio-BP, Chevron, NKK, and Shell.

Final report.—October 1981 for the field tests June 1982 for the laboratory tests.

Confidentiality.—December 31, 1984.

PROJECT NO. 131

Title.—1981 Harrison Bay Ice Movement Study.

Purpose and method.—To monitor ice movement in the Harrison Bay area during the winter of 1981. Ice movement data was obtained at 5 sites, north and north-east of Cape Halkett, while meteorology data was obtained only at one site north of Cape Halkett. Ice movement data was recorded by a mechanical reel system with onsite recording only. Meteorological data, consisting of wind speed and direction, barometric pressure and air and ice temperatures, was also recorded on site.

All equipment was installed on February 1, serviced on March 5-12 and recovered on May 30, 1981.

Contractor.—Oceanographic Services, Inc.

Operator.—None.

Cost.—Total cost $306,000, cost to next participant is $69,214.

Participants.—ARCO, Chevron, Exxon, Mobil, Phillips and Sohio.

Final report.—Harrison Bay Ice Movement Study, 1980-81.

Confidentiality.—September 23, 1985.

PROJECT NO. 132

Title.—Lower Cook Inlet COST No. 1 Well.

Purpose and method.—The objective was to drill a stratigraphic test well to approximately 14,800 feet at a nonproductive location. Drilling operations ceased on September 24, 1977, and the rig was moved from location on September 26, 1977. All data remains confidential.

Contractor.—ODECO (*Ocean Ranger*)

Operator.—Atlantic Richfield Co.

Report.—None.

Cost.—$11,120,000. No late participants.

Participants.—Aminoil, Amoco, Atlantic Richfield, BP Alaska Exploration, Champlin, Chevron, Cities, Depco, Exxon, Freeport, Getty, Hunt, Mobil, Murphy, Phillips, Shell, Texaco, and Union.

Date of final report.—September 26, 1980.

Confidentiality.—Under the Lower Cook Inlet COST No. 1 Well contract, information on the test well will remain confidential five years after plug and abandonment, or for 60 calendar days with the issuance of the first federal OCS lease in the area.

PROJECT NO. 133

Title.—Reindeer Island Stratigraphic Test.

Purpose and method.—To acquire stratigraphic information in the Midway Islands area prior to the 1979 joint Federal-State Beaufort Sea lease sale. Drilled and cored a deviated hole from Reindeer Island, a barrier island in the Beaufort Sea.

Contractor.—Brinkerhoff/Nabors.

Operator.—Sohio Alaska Petroleum Co., Pouch 6-612, Anchorage, Alaska 99502. Attn: R. C. Herrera.

Participants.—Amerada Hess, Amoco, ARCO, Chevron, Cities, Conoco, Exxon, Getty, Gulf, Idemitsu, Marathon, Mobil, Phillips, Shell, Sohio, Tenneco, Texas Eastern, Union and BPAE.

Cost.—$12.76 million.

PROJECT NO. 134

Title.—Norton Basin COST No. 1 Well.

Purpose and method.—The objective was to drill a stratigraphic test well to approximately 16,000 feet at a non-productive location. Drilling operations ceased on September 28, 1980, and the rig was removed from location on October 2, 1980. All data remains confidential.

Contractor.—Dan-Tex International *(Dan Prince).*

Operator.—ARCO Oil and Gas Co.

Report.—None.

Cost.—$19,500,000. Cost to next participant is $2,145,000.

Participants.—Al-Aquitaine, American Petrofina, Amoco, ARCO, Chevron, Cities, Conoco, Getty, Gulf, Marathon, Mobil, Pennzoil, Phillips, Sohio, Sunmark and Union.

Date of final report.—Oct. 8, 1980.

Confidentiality.—Under the Norton Sound COST #1 Well contract, all data regarding geophysical information will remain confidential for ten years and all data regarding geological information will remain confidential of five years after the plug and abandonment of the COST well, or for 60 calendar days after the issuance of the first federal OCS lease in the area.

PROJECT NO 135

Title.—Acquisition and Interpretation of Ice SLAR Imagery in the Bering Sea area.

Purpose and method.—To obtain Side Looking Airborne Radar (SLAR) imagery products of the Norton & Navarin Basins and the southern ice edge during March and April. A total of 5 missions were flown over Norton Sound, 4 missions were flown over the Navarin Basin and 2 missions were flown over the ice edge. Additional data obtained during these flights included aerial photography and laser profilometer data. Two missions were flown over Kathie's Floeberg to obtain aerial photography and laser profilometer data.

The data was analyzed to obtain floe size distributions, floe movement pressure ridge height data and the proportion of multi-year the first year ice in the Chukchi Sea. Other analysis considered consisted of instaneous velocity, radar signature characteristcs and a densitometric investigation of the SLAR imagery.

Contractor.—F. G. Bercha & Associates, Ltd.

Operator.—None.

Cost.—Total cost $535,000—cost to next participant $139,200.

Participants.—Amoco, ARCO, Exxon, Mobil, Phillips.

Final report.—Due February 1, 1982.

Confidentiality.—September 1, 1985.

PROJECT NO. 136

Title.—Beaufort Sea Shear Zone Monitoring, 1980–81.

Purpose and method.—The purpose of the study was to measure ice movement in the shear zone of the Beaufort Sea during March and April 1981. Three acoustic ice movement systems were deployed north of Prudhoe Bay in a line perpendicular to the shear zone to measure differential movements and rates. Landsat and NOAA satellite imagery were obtained to supplement the program for march and April. Weather observations at Dead Horse, Alaska, were collected for march and met data were collected at an on-ice station during April. This report reviews all these data and presents summaries showing the spatial extent of the shear zone and how it varies with time during the study period.

Contractor.—Oceanographic Services, Inc., Santa Barbara, Calif.

Operator.—None.

Report.—Beaufort Sea Shear Zone Monitoring Program 1980–1981, 1 Vol.

Cost.—$149,575 (cost to next participant $55,000).

Participants.—Amoco, Chevron, Mobil, Phillips, and Shell.

Final report.—August 1981.

Confidentiality.—December 1, 1986.

PROJECT NO. 137

Title.—Feasibility of a Year-Round Offshore Loading Terminal in Norton Sound.

Purpose and method.—To assess the feasibility and cost of marine loading terminals in Norton Sound and to examine the alternatives in terminal siting. Study results will include the preliminary design of the major system components including the terminal structure and foundation, crude and ballast water storage and treatment, loading arms, and mooring and fendering systems.

The study is divided into three phases. Phase I will develop information on environmental criteria and candidate structural concepts for the identifiable siting alternatives. In Phase II, a detailed evaluation of two candidate systems will be made, based upon the data from Phase I and the decision of study participants. The technical feasibility of each system will be established based on environmental factors, functional requirements and construction limitations. In Phase III, the sensitivity of the systems to changes in the design criteria will be studied. The effects of both operational and environmental factors will be established.

Contractor.—Brian Watt Associates, Inc.

Operator.—ARCO Alaska, Inc.

Report.—Feasibility of a Year-Round Offshore Loading Terminal in Norton Sound.

Cost.—$260,000.

Participants.—Amoco, ARCO, Chevron, Cities Service, Conoco, Exxon, Getty, Gulf, Marathon, Mobil, Phillips, Shell, Sohio and Union.

Final report.—November, 1981.

Confidentiality.—January 1, 1986.

PROJECT NO. 138

Title.—Statistical Data on 1981 Beaufort, Chukchi and Bering Sea Ice Ridging Using a Laser Profilometer.

Purpose and method.—Ice ridge statistics are to be collected over the Bering, Chukchi and Beaufort Sea using a laser profilometer during April 1981. Ice conditions will also be documented through aerial photography and an infrared linescanner. Sea ice ridge statistics will impact structure design and ice condition analysis will help address transportation and construction scenarios. Approximately 1,200 of the total 1,800 miles of data will be collected over the Chukchi Sea and Norton Sound.

Contractor.—Intera Environmental Consultants, Inc., 11511 Katy Freeway, Suite 630, Houston, Tex. 77079.

Operator.—None.

Cost.—$189,400. Cost to next participant—$42,057.14.

Participants.—Exxon, Shell, ARCO, Gulf, Conoco, and Chevron.

Final report.—August, 1981.

Confidentiality.—December 20, 1986.

PROJECT NO. 139

Title.—Beaufort Sea Multiyear Ice Features Study (BMIFS).

Purpose and method.—Obtain information on geometry, internal properties, and strength of multiyear ice features in the Alaska Beaufort Sea. The three-week field program, conducted in March-April 1981 near Prudhoe Bay, included aerial reconnaissance of multiyear floes, a sampling study of 8-10 floes, a detailed survey of one floe and ridge, and beam tests. The sampling study included four thickness measurements by augering and two cores for salinity, temperature, density and cyrstallography at each floe. The detailed survey included approximately five ridge profiles, floe thickness measurements, and cores. Approximately 15 beam tests and five fracture toughness tests were conducted on large beams (6" x 6" x 48"). More than 60 beam tests and 15 fracture toughness tests with small beams (2½" x 2½" x 20") were completed. Four cores were retrieved and shipped to CRREL for unconfined compression testing. An impulse radar was used to acquire additional ice thickness profiles.

Contractor.—Vaudrey and Associates, Inc.

Operator.—Shell Development Co.

Reports.—Separate reports for field program and laboratory test results.

Cost.—Total program cost $355,076. Cost to next participant is $42,970.

Participants.—Amoco, ARCO, Chevron, Conoco, Exxon, Gulf, Mitsui, Mobil, Phillips, Shell, Sohio, Texaco.

Final report.—Field Program Report—September 1981; Laboratory test Report—October 1981.

Confidentiality.—January 1, 1986.

PROJECT NO. 140

Title.—Study of the Technical and Economic Feasibility of Oil and Gas Pipelines and Crude Oil Loading Terminals in the Norton Sound, Alaska.

Purpose and method.—Objectives of the study are to: Establish preliminary pipeline design criteria for the Norton Sound study area. Establish feasible techniques for laying and connection of submarine pipelines and their protection and repair in the Norton Sound proposed 1982 lease sale area. Develop typical construction schedules and cost estimates that will allow the participants to reasonably estimate the costs and prepare schedules for pipeline aspects of field development in Norton Sound. Identify feasible crude loading terminal types in the Norton Sound environment.

Those objectives are carried out on two scenario cases: One on a gas trunkline from a hypothetical oil/gas field in the center of the study area and the Second on an infield gathering line connecting two production facilities.

Contractor.—R. J. Brown & Associates of America, Inc., 2010 North Loop West, Suite 200, Houston, Tex. 77018.

Operator.—None.

Cost.—Gross Cost $275,000. Cost of next participant is estimated to be $39,725.

Participants.—Amoco, Exxon, Getty, Marathon, Mobil, Phillips, Sohio, Socal.

Final report.—Dated: October 27, 1981.

Confidentiality.—To October 27, 1986.

PROJECT NO. 141

Title.—Protection of Offshore Arctic Pipelines.

Purpose and method.—The program is an engineering study of offshore arctic pipeline problems associated with sea ice and thawunstable permafrost. Topics include design gouge depth selection, trenching methods, shore approach design and cost, effects of thaw subsidence, redundant pipelines, loads from gouging and grounded ice, thermal expansion buckling, sediment dispersal during trenching, effects of causeways on sediment transport, offshore permafrost detection, and pipeline construction simulation. Most of the work is performed by Shell personnel. Consultants may be used for portions of some topics. No field work is involved.

Operator.—Shell Development Co.

Cost.—$600,000. Cost to next participant is approximately $40,000. No prerequisites.

Participants.—ARCO, Brown & Root, Cities Service, Coflexip & Services, Conoco, Dome Petroleum, Getty, Gulf Canada, Lockheed Missiles & Space, McDermott, Nippon Kokan K.K. America, Petro-Canda Exploration, Phillips, Saipem, Shell Development, Standard Oil Company of California, Texaco, Union Oil Company of California, and Volker/Stevin Dredging.

Final report.—April, 1982.

Confidentiality.—March 31, 1987.

PROJECT NO. 142

Title.—Bering Sea Comprehensive Oceanographic Measurement Program (Bering Sea-COMP).

Purpose and method.—This program monitor oceanographic and meteo-logical conditions in the Bering Sea over a two-year period. Simultaneous measurements of winds and waves from the five major basins can be used to develop operational and design criteria for each location. Measure data will include: (1) storm surge (bottom pressure) and near-bottom current in eastern Bristol Bay and Norton Sound; (2) wave frequency spectra in Bristol, St. George St. Lawrence, Norton, and Navarin basins; (3) wind spectrum and direction, barometric pressure sea and air temperature in Bristol, St. George, St. Lawrence, and Navarin basin; and (4) land-based wind speed and direction, barometer pressure and air temperature on St. Paul, St. Matthew, and St. Lawrence Islands. Although the storm data can be used to calibrate hindcast models, this program does not indicate the actual storm hindcast study.

For reasons of joint industry participation, Bering Sea COMP has been divided into two overlapping one-year measurement programs. Phase 1 will consist of measurements made between the summer 1981 and June 1982, and associated tasks. Similarly, Phase 2 will cover the period June 1982 and June 1982. Participation in Phase 1 will be prerequisite for Phase 2.

Contractor.—Brown and Caldwell Consulting Engineers.

Operator.—Exxon Company U.S.A.

Reports.—Monthly and Yearly data reports will be provided an addition to a final report summarizing all of the program activities.

Cost.—The total estimated cost of Phase 1 is $4,872,000. Cost next participants: one-half of program cost to date plus one-sixth of remaining cost.

Participants.—Exxon, ARCO, Chevron, Cities Service, Shell.

Final report.—Phase 1—October 31, 1982, Phase 2—October 31, 1983.

Confidentiality.—Continues for two years after a federal oil and gas lease sale has been held in all of the Bering Sea basins or until June 30, 1983, whichever first occurs.

PROJECT NO. 143

Title.—Mechanical Properties of Sea Ice-Phase 1.

Purpose and method.—Combined experimental and theoretical program to determine the stress-strain relations and failure criteria of sea ice. Phase I will consider ice from multiyear pressure ridges. Improved equipment and techniques for collecting and testing sea ice will be developed. Ice will be collected from a minimum of 10 multiyear ridges in the Beaufort Sea and shipped to CRREL for testing. At lease 240 uniaxial compression tests will be conducted to assess variability among ridges. At least 90 tests in uniaxial tension and compression and multiaxial compression will be conducted at two temperatures, two strain rates, and two values of constant stress (creep) to evaluate sensitivity. Shell will develop theoretical constitutive relations and failure criteria to be evaluated with the laboratory test data.

Contractor.—U.S. Army Cold Regions Research and Engineering Laboratory (CRREL).

Operator.—Shell Development Co.

Reports.—1. Field and laboratory programs by CRREL. 2. Statistical summary of variation among ridges by Shell. 3. Physical interpretation of ridge variation data by Shell. 4. Summary of sensitivity tests by Shell. 5. Comparison of theoretical relations and test data by Shell.

Cost.—$750,000. Cost to next participant is $102,273.

Participants.—Amoco, ARCO, Chevron, Exxon, Gulf, Mitsui, Shell, Sohio, Texaco, U.S. Government (USGS).

Final report.—November 1981—February 1982.

Confidentiality.—CRREL test data are public. Shell reports are confidential until three years after completion of Phase I study (approximately February 1985).

PROJECT NO. 144

Title.—SAR 1981 Data of Beaufort and Chukchi Sea Ice.

Purpose and method.—The objective of the project is to use a high resolution synthetic aperture radar (SAR) to acquire detailed data on sea ice type and roughness in the Beaufort and Chukchi Seas. The data collection will include approximately 50,000 Km^2 of SAR imagery of sea ice. Approximately 25 percent of the data will be analyzed for multiyear floe statistics. The occurrence, frequency and orientation of ice ridges will also be mapped on the same imagery.

Contractor.—Intera Environmental Consultants, Inc., 11511 Katy Freeway, Suite 630, Houston, Tex. 77079.

Operator.—None.

Cost.—$119,800. Cost to next participant—$27,114.28.

Participants.—Gulf, Exxon. ARCO, Sohio and Chevron.

Final report.—August, 1981.

Confidentiality.—February 15, 1987.

PROJECT NO. 145

Title.—Summer Ice Conditions in the Alaskan Beaufort Sea.

Purpose and method.—This report develops a general statistical model of the start and duration of different ice concentrations in various water depths in the 1979 Beaufort Lease Sale area. The study used 27 seasons of ice data from Project No. 35.

Operator.—Shell Development Co., Bellaire Research Center. Contact: Patents & Licensing Division, Shell Development Co., Box 2463, Houston, Tex. 77001.

Report.—"Summer Ice (and Wave) Conditions in the Alaskan Beaufort Sea". BRC Technical Progress Report 4-78, about 100 pages of text, tables, figures and appendices.

Cost.—Fixed license fee to Shell: $6,500. Prerequisite: Project No. 35.

Final report.—April, 1978.

Confidentiality.—April, 1990.

PROJECT NO. 146

Title.—Review and Update of Summer Ice Conditions in the Alaskan Beaufort Sea.

Purpose and method.—The second report compares data on ice conditions from three summers, 1976-1978, when more detailed observations were made, to date from 1955-1975. It concludes that ice conditions outside the barrier islands are probably worse than the older data indicated. The recent data is available in Project No. 117.

Operator.—Shell Development Co., Bellaire Research Center. Contact: Patents & Licensing Division, Shell Development Co., Box 2463, Houston, Tx. 77001.

Reports.—"Review and Update of Summer Ice Conditions in the Alaska Beaufort Sea". BRC Technical Progress Report 56-80, about 40 pages of text, tables, figures and appendices.

Cost.—Fixed license fee to Shell: $5,000. Prerequisites: Project No. 145, Project No. 117.

Final report.—November, 1981.

Confidentiality.—April, 1990.

PROJECT NO. 147

Title.—1981 Beaufort Sea Summer Oceanographic Program.

Purpose and method.—To measure waves, tides, surge, currents and water temperature at two locations in Harrison Bay (30′ and 60′ water depth) and one location off Pingok Island (30′ water depth) in the Beaufort Sea, and wind velocity, barometric pressure and air temperature at Cape Halkett and Narwhal Island. Surge gauges were installed at Cape Halkett, Atigaru Point, West Dock, East Dock, Narwhal Island and Tigvariak Island.

Contractor.—Oceanographic Services, Inc.

Operator.—None.

Report.—The report was issued in two parts: Phase I—Meteorological, surge and shallow oceanographic measurements: 16 August—30 November 1981. Phase II—Deep oceanographic measurements: 16 August 1981—6 February 1982.

Cost.—Total cost approximately $411,600. Cost to next participant is approximately $98,800.

Participants.—Amoco, ARCO, Chevron, Exxon, Mobil, and Shell.

Final reports.—January 1982 (Phase I) and March 1982 (Phase II).

Confidentiality.—Expires January 1, 1992.

PROJECT NO. 148

Title.—1981 Breakup Study of the Barrier Island Harrison Bay.

Purpose and method.—A field trip in early June will allow refurbishment of storm surge gages deployed during Freezeup Study, measurement of selected beach profiles, and documentation of general ice conditions before breakup.

Another field trip will be conducted upon initiation of breakup and last about three weeks. It will allow documentation of any ice rideup or pileup events that may happen during breakup, recording of conditions causing rideup or pileup, and collection of storm surge data. Daily helicopter flights (weather permitting) will allow continuous monitoring of these conditions during breakup and also observation of the multiyear ice grounded near the barrier islands.

Contractor.—Vaudrey and Associates, Inc.

Operator.—None.

Report.—Draft, September 30, 1981. Final, November 20, 1981.

Cost.—$89,340. Cost to next participant: $8,122 plus 50 percent of amount invoiced to date.

PROJECT NO. 149

Title.—Bering Sea Cost Well Program.

PROJECT NO. 150

Title.—1981 Bowhead Whale Population Study.

Purpose and method.—1. To obtain an accurate estimate of the number of bowheads by aerial survey technology while the bowheads were summering in the Canadian Beaufort. This count would be independent of the estimates resulting from the spring ice camp counts conducted at Barrow.

2. To obtain an accurate estimate of bowhead calf production and therefore, determine the productivity of the herd.

3. To obtain information regarding the extent of the summer range, patterns of use and movement, and distribution of bowheads within that range.

4. To obtain information regarding the size (age) structure of the bowhead population by calculating whale lengths using measurements from aerial photographs.

Aerial surveys were used to obtain information on the numbers, movements, distribution and cow-calf pairs. Visual observations of whale behavior were used for determining the correction factor for time spent below the surface. Known-scale vertical photographs were used to determine the lengths of whales and to identify individual whales.

There were four surveys conducted in the Canadian Beaufort during the following time frames:

Survey 1—July 18 to July 25; Survey 2—August 5 to August 17; Survey 3—August 19 to August 29; and Survey 4—September 7 to September 14.

Contractor.—LGL Limited, Environmental Research Associates, Suite 414, 44 Eglinton Avenue West, Toronto, Canada M4R 1A1. Attn: Ralph Davis.

Operator.—Sohio Alaska Petroleum Co., Pouch 6-612, Anchorage, Alaska 99502. Attn: Deb Borah.

Participants.—ARCO, BP, Chevron, Exxon, Phillips, Shell, Sohio and the State of Alaska. Study conducted in conjunction with a study being funded by the following Canadian Companies: Dome, ESSO and Gulf Canada.

Costs.—Overall total—$522,000, U.S. Total—$386,000; Participant's share—Not to exceed $60,000; and late participant charge—Additional $15,000.

PROJECT NO. 151

Title.—Alternative Retained Fill Island Systems in the Beaufort Sea.

Purpose and method.—To evaluate the concept of retained fill island systems for varying water depths in the Beaufort Sea. Three types of systems will be evaluated as to engineering feasibility, construction methodology, schedule and comparative costs. The three basic systems are: articulated precast concrete or steel arc segments, concrete or steel caisons, cellular sheet pile bulk-head. A report will be issued documenting the work done in the study.

Contractor.—SP Group.

Operator.—SP Group.

Cost.—$167,000—cost to next participant, $50,100.

Participants.—Amoco, Chevron, Exxon, Marathon, Phillips.

Confidentiality.—September 15, 1986.

PROJECT NO. 152

Title.—Experimental Work on Punching Shear Resistance of Concrete Structures for the Arctic.

Purpose and method.—This work is an outcome of the recommendations made in AOGA Project #121. It is primarily aimed at advancing the current state of knowledge on the punching shear resistance of concrete plates and shells of the proportions likely to be used for arctic structures. Recommending design methods more applicable to such structures, than those currently available in Codes of Practic, is also another important objective of this study. The program concentrates on a selected series of scaled physical models of reinforced concrete panels tested under simulated concentrated ice loadings to assess serviceability and punching shear criteria. Experimental work will be carried out on ten model panels. Most tests will be on single curvature shells. One flat slab panel is included to assist in correlating this series of tests with previous work. One test panel will also be subjected to repeated loads to assess the likely deterioration in shear resistance.

Contractor.—Brian Watt Associates, Inc., Houston, (main contractor). Taylor Woodrow Research Laboratories. U.K. (Subcontractor for test work).

Operator.—None.

Report.—None.

Cost.—$300,000—cost to next participant: $10,000 late fee plus equal share.

Participants.—ARCO, Exxon Production Research, Gulf Research and Development, Mobil Research and Development, Phillips, Socal, Shell, Sohio.
Final report.—August, 1982.
Confidentiality.—January 1, 1984.

PROJECT NO. 153

Title.—Harrison Bay Ice Gouge Study.

Purpose and method.—To obtain data on possible gouges caused by several large multi-year ice pieces and ice islands found in Harrison Bay. The project has been divided into 3 phases. Phase I occurred before breakup 1981 and obtained size data in 8 large ice pieces or groups of pieces. Underwater profiles were obtained at several and pingers were installed to make the locations for later work. Phase II occurred during the 1981 open water season and a side scan sonar was used to determine if the pieces had gouged the bottom. Mosaics of the area around several of the pieces will be put together. Phase III has not been authorized yet but will attempt to retrieve soil borings/samples across any gouges found.

Contractor.—Oceanographic Services, Inc.
Operator.—None.
Cost.—$225,099 without Phase III. Cost to next participant: $61000.
Participants.—Amoco, Chevron, Conoco, Mobil, Gulf.
Final report.—Due: December 1, 1981.
Confidentiality.—December 1, 1986.

PROJECT NO. 154

Title.—Digital Stereometry.

PROJECT NO. 155

Title.—Evaluation of Artifical Islands for Norton Basin Lease Sale Area.

Purpose and method.—To assess the feasibility and cost of using artificial islands of various types for exploration and production in the proposed 1982 Norton Sound lease sale area. Study results will include the preliminary designs of islands, the construction methods, and the breakdown of construction costs.

The study will be conducted in three phases. First, site specific design criteria will be developed for the target areas selected for the study. This includes an evaluation of the capabilities and limitations of dredging equipment.

In the second phase, preliminary designs for various island types will be made for each target area. The construction procedures and equipment spread will be identified. The island construction cost will be estimated based on the plant labor, and the materials required.

In the final phase, the sensitivity of island design and construction cost to design criteria and island location changes will be examined. Results of this study can be used to estimate island cost in any location in the proposed Norton Basin lease sale area.

Contractor.—Brian Watt Associates, Inc.
Operator.—ARCO Alaska, Inc.
Report.—(Title to be Decided).
Cost.—$404,000.
Participants.—ARCO, Chevron, Conoco, Getty, Gulf, Marathon, Mobil, Phillips, Shell, Sohio.
Final report.—February, 1982.
Confidentiality.—July 15, 1987.

PROJECT NO. 156

Title.—Ice Interaction With Sloping Barriers.

Purpose and method.—Ice barriers having slopes of 45 degrees and 60 degrees with respect to the horizontal area were modeled at a scale of 1:50 in ARCTEC's ice model bains. The tests were designed to examine barrier performance in terms of ice deflection capability and to measure the resulting forces, as influenced by ice thickness, ice properties, barrier slope, barrier freeboard, ice deflector height, and water depth. In most tests a large ice pileup formed in front of the barrier. Two series of tests were conducted.

Contractor.—ARCTEC, Inc.
Operator.—Exxon Production Research Co.
Reports.—Performance of Model Plane-Faced Ice Barriers of 45° and 60° Angles to the Waterline, ARCTEC, Inc. Final Report 319C.

Supplement to ARCTEC, Inc. Final Report 319C Exxon Production Research Company.

Test Plan Ice Barrier Tests Second Series ARCTEC, Inc. Report No. 383C-1.

Second Series—Tests of Plane-Faced Ice Barriers of 45° and 60° Angles to the Waterline, ARCTEC, Inc. Final Report 383C.

Supplement to ARCTEC, Inc. Final Report 383C Exxon Production Research Company.

Cost.—$25,000.

Participants.—Exxon.

Final report.—Completed.

Confidentiality.—December 31, 1986.

PROJECT NO. 157

Title.—Model Tests of First Year Ridges (1977).

Purpose and method.—Model tests of unconsolidated ridges were conducted in 1977 to provide small-scale data for analytical modeling of the full-scale first-year ridge/structure interaction. At a scale of 1:50, a total of 12 tests in sheet ice, 22 tests in unconsolidated rubble fields, and 9 tests in unconsolidated ridges were conducted using two cylindrical structural models. The measured model sheet ice properties included: flexural, crushing, and shear strengths, elastic modulus, and friction. The measured model ice rubble properties included: shear strengths, compressibility, porosity, and friction. The rubble shear strength was measured by a direct shear box (1 ft x 1 ft x 1.5 ft) suspended in the test basin. The strength results were in part interpreted and presented at the POAC 1979 Conference.

Contractor.—ARCTEC, Inc.

Operator.—Exxon Production Research Co.

Report.—Model Tests of Unconsolidated Ridge Properties and Failure Forces.

Cost.—$15,000.

Participants.—Exxon.

Final report.—Completed.

Confidentiality.—December 31, 1986.

PROJECT NO. 158

Title.—Model Tests of First-Year Ridges (1979).

Purpose and method.—Model tests of partially consolidated firstyear ridges were conducted in 1979 to study their mechanical properties and compare them with those of unconsolidated rubble and parental sheet ice.

At a scale of 1:40, cylindrical and 45° and 60° conical structure models were tested in 8 unconsolidated rubble fields, 8 partially consolidated rubble fields, 9 partially consolidated ridges, and 14 sheet ice conditions. Shear properties of unconsolidated and consolidated rubble were tested in hydraulically operated, direct shear apparatus (2 ft. x 2.5 ft. x 1.5 ft).

Contractor.—ARCTEC, Inc.

Operator.—Exxon Production Research Co.

Report.—Model Study of Partially Consolidated Ice Rubble and Pressure Ridges.

Cost.—$28,000.

Participants.—Exxon.

Final report.—Completed.

Confidentiality.—December 31, 1986.

PROJECT NO. 159

Title.—Preliminary Design of Ice Breaking Tanker for the Bering Sea.

Purpose and method.—Determination of the RFR for shipment of crude oil from Norton Sound by icebreaking tanker. The RFR shall be determined from construction and operating costs estimated for a tanker design in this study.

Contractor.—Arctec Inc.

Operator.—ARCO Oil and Gas Co.

Report.—Peliminary results available in May. Final report available in June, 1982.

Cost.—Work performed under time and material contract. Estimated cost at completion: $202,875.

Participants.—Sohio, Gulf, Phillips, Chevron, Marathon, Shell, Mobil and ARCO.

Final report.—June 30, 1982.

Confidentiality.—September 1, 1986.

PROJECT NO. 160

Title.—1981 Freezeup Study of Barrier Island Chain and Harrison Bay.

Purpose and method.—To monitor ice rideup, ice pileup, and storm surges along the Alaskan Beaufort coast from Flaxman Island to Cape Halkett. Four field trips are planned at two or threeweek intervals from September to November. During each of these trips, helicopter reconnaissance will be conducted, and interesting ice rideup and pileup features will be visited, documented, and photographed. On the first trip 68 exisiting storm surge gages will be refurbished, and they will be read at each subsequent trip.

Contractor.—Vaudrey & Associates, Inc., 3030 Bonney Briar Drive, Missouri City, Tex. 77459, (713) 437-3146.

Operator.—None.

Report.—April 1982.

Cost.—$73,900. Cost to next participant $6,158 plus late fee of 50 percent of previously invoice amounts.

Participants.—Amoco, Arco, Chevron, Conoco, Exxon, Gulf, Marathon, Mobil, Phillips, Shell, Sohio.

Confidentiality.—April 1987.

PROJECT NO. 161

Title.—Field Test of Control de Erosion In-Situ Shore Protection Techniques.

PROJECT NO. 162

Title.—Norton Sound Production Structure.

PROJECT NO. 163

Title.—A Synthesis of Sea Ice and Current Information for the Norton and Navarin Basins.

Purpose and method.—Compile and synthesize ice and current data from various sources (satellite imagery, NOAA field work, OCSEAP projects), and provide a report summarizing ice and current conditions in the Norton and Navarin basins. Summarize with graphs and tables for use in aiding management and engineering decisions related to petroleum development. Report to include summary discussions of ice/current interactions, overall behavior of ice and current fields on the Bering shelf, and the effects of local winds upon ice. Results of current research to be incorporated to ensure validity of results.

Contractor.—Science Applications, Inc.

Operator.—None.

Reports.—(1) A Synthesis of Sea Ice and Current Information for the Nortion Basin. (2) A Synthesis of Sea Ice and Current Information for the Navarin Basin.

Cost.—$49,090.

Participants.—Union, ARCO, Marathon and Chevron.

Final report.—February, 1982.

Confidentiality.—February, 1987.

PROJECT NO. 164

Title.—Bering Sea Soil Boring Programs, 1981 Norton Sound and St. George Basin.

Purpose and method.—Provides geotechnical information that can be utilized to evaluate subsurface sea floor materials and foundation conditions on a regional basis. These data can be used for conceptual designs for facilities development and are directly applicable to tentative selection of drilling rigs, preliminary assessment of seismic response of foundation soils and an insight concerning drilling and excavation characteristics of the soil.

Contractor.—McClelland Engineers, Inc., 5450 Ralston Street, Ventura, Calif. 93003.

Operator.—None.

Cost.—Fixed Fee, $70,000 for Norton Sound $62,000 for St. George Basin.

Participants.—Norton Sound: Chevron, Exxon. St. George Basin: Amoco, Chevron, Exxon.

Final report.—1981 Geotechnical Investigation, Norton Sound-Offshore Alaska. 1981 Geotechnical Investigation, St. George Basin-Bering Sea, Alaska. Both reports dated January 1982.

Confidentiality.—By written consent from McClelland Engineers, Inc.

PROJECT NO. 165

Title.—Digitizing and Analyzing Airborne Laser Profilometer Data of Arctic Sea Ice.

Purpose and method.—To obtain, digitize, and analyze airborne laser profilometer data, recorded in analog form on the Beaufort, Chukchi, and Bering Seas by CRREL investigators. The 13,000 track-km of data will be analyzed in approximately 2-km sections to obtain statistics on frequency of occurrence, height distribution, width distribution, and ridge cross-sectional area. Data summaries for contiguous 50-km sections will be prepared.

Contractor.—LeSchack and Associates.

Operator.—None.

Cost.—Total cost—$163,441. Cost to next participant—$20,430 plus $10,215 late fee.

Participants.—ARCO, Chevron, Exxon, Gulf, Marathon, Shell, Sohio.

Confidentiality.—Five years after Final Report date.

PROJECT NO. 166

Title.—Norton Sound Ice Behavior Study.

Purpose and method.—The objective of this project is to obtain, analyze and interpret a data set on ice motion and ice conditions throughout Norton Sound during the winter of 1981-82. A total of 11 ice drifting buoys were deployed in three missions spaced at 4-6 week intervals. Three buoys measured ocean currents, surface winds and air temperatures along with providing position data. The remaining eight buoys provided position data only. The analysis of this data was to provide ice motion along with environmental conditions, a description of the ice season in North Sound and ice thickness data.

Contractor.—Flow Industries, Inc.

Operator.—None.

Cost.—Total cost—$214,272. Cost to next participant is $44,640.

Participants.—ARCO, Chevron, Exxon, Marathon, Mobil.

Final report.—Due October, 1982.

Confidentiality.—October 9, 1986.

PROJECT NO. 167

Title.—Harrison Bay Ice Movement Study 1981-82.

Purpose and method.—The objective of this project is to measure ice movement in the landfast ice area of Harrison Bay. Six mechanical reel systems were deployed in late January, serviced in March and retrieved in May. One meteorological package was installed at one of the offshore sites. Data, recorded on site only, included ice movement rates, wind speed and direction, barometric pressure, ice temperature and air temperature.

Contractor.—Oceanographic Services, Inc.

Operator.—None.

Cost.—Total cost—$345,092. Cost to next participant is $92,515.

Participants.—Chevron, Exxon, Mobil, Shell and Sohio.

Final report.—Due September 1, 1982.

Confidentiality.—September 1, 1987.

PROJECT NO. 168

Title.—Air Curtain Destructor (ACD).

Purpose and method.—The purpose of the program is to evaluate an open-pit ACD type incinerator, and define a configuration and operating procedure for the controlled burning of oil and oiled debris in terms of disposal rate, emission levels (smoke), cost, versatility and portability.

A sequence of experiments will be run to optimize an ACD system for arctic operation. Modifications will be made to a full-scale prototype during the progression of experiments to maximize the burning rate and minimize the smoke emissions. Equipment requirements and operating procedures will be identified so that a system can be designed, constructed and then operated in the field.

Contractor.—Texas A & M University.

Administrator.—Exxon Co., U.S.A.

Report.—Describes experimental results, system performance, typical waste compositions, major system requirements, and recommended operating procedures.

Cost.—$100,000.

Participants.—ABSORB Member Companies.

Completion date.—June 1982.

PROJECT NO. 169

Title.—Transfer Systems and Storage Systems.

Purpose and method.—The purpose of this project is to determine the most effective equipment and techniques that can be used by ABSORB to transfer and temporarily store recovered oil, water, and contaminated debris in the case of an oil spill. A recommendation will be made that identifies the types, capacities, and quantities of equipment needed by ABSORB to perform transfer and storage operations. In addition, a description will be made on how to implement the use of the equipment in the field.

A survey of existing equipment and techniques will be made to determine which are applicable to ABSORB operations. The spill scenarios outlined in the ABSORB Oil Spill Contingency Plan will be the basis for identifying what types of operations will be required during a cleanup and which equipment can be used to best accomplish these operations.

Contractor.—Marine Consultants.

Administrator.—Exxon Company, U.S.A.

Report.—A separate report will be issued for transfer systems and storage systems. The report will describe operations identified in the scenarios, possible solutions, advantages and disadvantages of the solutions, and equipment recommended to accomplish a specific task. Pictorial descriptions, graphs, tables, and matrices will be used to describe the results of the study.

Cost.—Transfer $28,050, storage $28,050, total $56,100.

Completion date.—January 1982.

Final report.—January 1982.

PROJECT NO. 170

Title.—Beach Cleanup Machine.

Purpose and method.—The purpose of the program is to design, build and field test a full scale prototype machine that removes oil, tar, and small debris from flat ice or beach areas. An evaluation of the machine's performance will be made to determine if it effectively removes the contaminant from the substrate.

A series of experiments will be conducted to optimize the oil pickup mechanism. Various types of substrate materials, oils, and debris will be used for the test to determine the ultimate design and recommended operating procedures for the machine.

The prototype will be delivered to ABSORB after the test program is complete.

Contractor.—Moorehead Engineering—Dallas, Tex.

Administrator.—Exxon Co., U.S.A.

Report.—A final report will be issued that describes the results of the machine's field performance, its preferred pickup mechanism design, and operating procedures. Photographs, video tapes, or movies will be provided to show the operation of the machine.

Cost.—$37,700.

Participants.—ABSORB Member Companies.

Completion date.—May 1982.

PROJECT NO. 171

Title.—Geotechnical Characteristics of Artificial Islands.

PROJECT NO. 172

Title.—Large Scale Stability Test of Sand-bagged Slope Protection.

PROJECT NO. 173

Title.—Southern Bering Sea Production System Study.

PROJECT NO. 174

Title.—Arctic Cone Exploratory Structure.

PROJECT NO. 175

Title.—1982 Level Ice and Pressure Ridge Characteristics in Bering and Chukchi Seas During Deployment of USCGC *Polar Star.*

Purpose and method.—To determine level ice properties and pressure ridge geometries in the Bering and Chukchi Seas during the March, April, and May 1982 deployment of the Coast Guard icebreaker *Polar Star*. Power requirements of the vessel to penetrate surveyed pressure ridges will also be measured. The results of this study will provide data for marine transportation studies and ice force predictions on offshore structures, and statistics on pressure ridge frequency and severity. An interesting aspect of the pressure ridge studies will be underwater photography and television of ridge keels.

Contractor.—ARCTEC, Inc., 9104 Red Branch Road, Columbia, Md. 21045 (301) 730-1030.

Operator.—None.

Report.—September 1982.

Cost.—$373,639. Cost to next participant: $28,741 plus a late fee of 50 percent of previously invoiced amounts.

Participants.—Amoco, ARCO, Chevron, Conoco, Exxon, Gulf, Marathon, Mobil, Phillips, Shell, Sohio, and Texaco.

Confidentiality.—September 1987.

PROJECT NO. 176

Title.—Additional Ice Movement Stations in Harrison Bay.

Purpose and method.—Measure winter ice movement rates at three locations in the eastern portion of Harrison Bay during January-May, 1982. Three dual wireline stations were installed in water depths between 40 and 80 ft. This program complements "Harrison Bay Ice Movement Study 1981-82" (Project No. 167), which has six movement stations in the western part of Harrison Bay, and a meteorology station to record wind speed and direction, barometric pressure, air temperature, and ice temperature.

Contractor.—Oceanographic Services, Inc.

Operator.—None.

Reports.—Final report and computer data tape of ice movements.

Cost.—Total program cost $159,018. Cost to next participant is $55,755. Participation in "Harrison Bay Ice Movement Study 1981-82" (Project No. 167) is a prerequisite for this program.

Participants.—Exxon, Mobil, Shell.

Final report.—September 1, 1982.

Confidentiality.—October 1, 1987.

PROJECT NO. 177

Title.—SAR Data of Bering, Beaufort and Chukchi Sea Ice—April 1982 Survey.

Purpose and method.—A high resolution synthetic aperture radar (SAR) will be used to collect detailed information on sea ice type, roughness and size distribution in the Beaufort, Chukchi and Bering Seas. Approximately 1,800 miles of data are to be collected, distributed 60 percent Bering, 20 percent Chukchi and 20 percent Beaufort.

Contractor.—Intera Environmental Consultants, Inc., 11511 Katy Freeway, Suite 630, Houston, Tex. 77079.

Operator.—None.

Cost.—$210,512. Cost to next participant—$38,350.

Participants.—ARCO, Chevron, Conoco, Exxon, Gulf, Mobil, Shell and Sohio.

Final report.—Due September 30, 1982.

Confidentiality.—December 23, 1987.

PROJECT NO. 178

Title.—Statistical Data on Sea Ice Ridging—April, 1982 Survey.

Purpose and method.—Ice ridge statistics are to be collected over the Beaufort, Chukchi and Bering Seas, using a laser profilometer during April 1982. Ice conditions will also be documented through aerial photography and an infrared linescanner. Sea ice ridge statistics will impact structure design and ice conditions analysis will help address transportation and construction scenarios. Approximately 2,400 miles of data are to be collected, distributed 60 percent Bering, 20 percent Chukchi and 20 percent Beaufort Sea.

Contractor.—Intera Environmental Consultants, Inc., 11511 Katy Freeway, Suite 630, Houston, Tex. 77079.

Operator.—None.

Costs.—$289,000. Cost to next participant—$56,286.

Participants.—ARCO, Chevron, Exxon, Gulf, Mobil, Shell and Sohio.
Final report.—Due September 15, 1982.
Confidentiality.—December 23, 1987.

U.S. ARCTIC SCIENCE POLICY: THE NATIONAL PERSPECTIVE

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> *"Success in achieving our national "goals for the 1980's--more vigorous "economic growth, enhanced national "security, a stronger competitive "position in world markets, better "health and quality of life for all "our people--will depend in large part "on knowledge and technological develop- "ments which can come only from scien- "tific research.*
>
> George A. Keyworth II
> Science and Technology Adviser
> to the President

1. ABSTRACT

There is no better example of research that is directed simultaneously to all four national goals than scientific research on arctic problems. The resource development in the United States arctic and subarctic regions and adjacent waters and the deployment of defense systems at high latitude in North America and in the Arctic Ocean have become a vital part of our nation's economy, trade, and security. Health and quality of life are important factors as the related human activities expand to the high north, enter a demanding unfamiliar environment, and encounter native populations whose traditions have been honed by centuries of life under adverse natural conditions.

The development of a cost-effective arctic technology that is both compatible with a reasonable policy of environmental protection and beneficial to the local populations, poses a challenge that demands a massive and nationally coordinated research effort in basic and applied science--a research effort that can only be conducted in the very environment whose bounty and perils are to be unraveled, assessed, and understood.

Arctic research coordination was attempted in the past at the federal level, but these attempts have not been very successful. Recent developments, however, are encouraging, and indicate that a National Arctic Research Policy may be in the making. This article summarizes key factors that must be taken into account in the establishment of such a policy and outlines the basic elements that the policy should contain.

1. STATUS OF ARCTIC RESEARCH COORDINATION

Of all countries bordering on the Arctic, the United States is the only one without a national institute, laboratory, or any other organization devoted to the sustained planning and support of arctic research. Up to now, the responsibility for planning, implementing, and funding arctic research has been divided between several federal agencies, the State of Alaska, and private groups whose mandates or objectives are often unconnected.

The result of this pluralistic approach to U.S. science in the Arctic is that basic research has been conducted in piece-meal fashion. Individual studies are proposed and supported separately, and their costly logistic requirements must be funded in competition with research carried out under lesser demanding environmental conditions in the rest of the country. Fundamental data-gathering and interpretation of information has been the responsibility of public agencies whose missions are separate and whose budgets may not reflect the priorities of arctic issues.

Applied research has often been proprietary. Development often preceded the acquisition of necessary scientific knowledge; scientific research in the Arctic has frequently been supported as a corrective measure only after the need for such knowledge was made apparent by serious mistakes or problems. Also, as industrial research became dominant in volume and continuity, much scientific information and understanding of arctic processes moved out of the public domain. Finally, many of the applied scientific goals relate to issues that often are in the spotlight of public controversy or political rhetoric, such as environmental conservation, resource extraction and transport, cultural change, or defense.

A boom-bust development characterized most U.S. arctic research, as scientific thrusts, often short-term and unrelated, followed one another.

Because of the lack of continuity in science support, teams that achieved scientific advances disintegrated after completion of their missions, often without complete documentation of their work. At later dates whole new groups had to be formed to resume studies on the same subject. Long-term research has been losing progressively to short-term crash studies.

This state of affairs is in sharp contrast w'th arctic research and arctic science policies of most other circumpolar nations. The Soviet Union, for instance, has four explicit and interrelated goals toward which their arctic policy and related research thrusts are oriented: 1. Industrialization of the Soviet Arctic and the four million people who live there; 2. Development of arctic oil and gas fields and of the mining industry in the Arctic; 3. Integration of marine and land transportation systems; and 4. Consolidation of northern defense systems. It is estimated that 20-25 thousand scientists work on arctic research in the Soviet Union; no less than 170 scientific institutes are involved in research linked to offshore oil and gas exploration and exploitation alone, and vast numbers of institutes and specialized technical and vocational schools develop human expertise in a planned effort to achieve the Soviet arctic policy goals. And the Soviet Union has 37 Arctic research vessels and 19 ice-breakers--while the U.S. has only one Antarctic research vessel and five ice-breakers which generally are not available for research.

In the past, there have been several high level attempts to coordinate U.S. arctic research programs. For instance, the Interagency Arctic Research Coordinating Committee (IARCC) was established in 1967 and given a number of tasks that sounded lofty and good. A few years later, the expectation of an accelerated pace of activities in the U.S. Arctic led to several U.S. policy decisions. To be specific, National Security Decision Memorandum (NSDM) No. 144 (21 December 1971) established as national policy "...that the U.S. will support the sound and rational development of the Arctic, guided by the principle of minimizing any adverse effects to the environment; will promote mutually beneficial international cooperation in the Arctic; and will, at the same time, provide for the protection of essential security interests in the Arctic..." This was further amplified in NSDM 202 (22 January 1973) in which "The President... reaffirmed his desire that the U.S. actively develop and pursue programs for increasing bilateral and multilateral cooperation in the Arctic, particularly in the areas of scientific research, resource development, and environmental protection."

Unfortunately, mechanisms for funding and for the adequate implementation of these policy decisions were not developed concomitantly. NSDM Decision Memorandum #144 assigned the task of developing a coordinated plan for scientific research in the Arctic to IARCC. But not much happened until 1978, when the President's Science Adviser informed the pertinent agencies of the formal dissolution of IARCC. A study conducted by the Departments of Interior, Defense and Energy (1982) came to the conclusion that "...the intentions of Decision Memorandum 144 have never been implemented and the U.S. lacks an explicit arctic research policy". It is apparent after reading in the documented history of government attempts to coordinate arctic research that interagency disputes over areas of responsibility frustrated the implementation of a National Arctic Research Policy.

In this context, and to emphasize contrast, Antarctica is often pointed out as an area for which the United States has a clear-cut and effectively implemented research policy, in spite of the fact that we have no indigenous people there, that there is no resource development (yet), and that military activities and territorial claims are suspended as long as the Antarctic Treaty is in force. However, any direct comparison between arctic and antarctic policies becomes fallacious for two reasons. First, while there exists an international treaty on the Antarctic, the Arctic is one notable area as yet largely untouched by existing or prospective international agreements (a fact which is in itself most unfortunate). Second, because of the very limited interest in Antarctica by most government agencies, no "turf" problems arose when one agency (the National Science Foundation) was directed to maintain a U.S. presence in the Antarctic.

2. DIFFICULTIES IN THE ESTABLISHMENT OF A NATIONAL ARCTIC RESEARCH POLICY

Disputes over institutional "turf" are not the only obstacle in the way of the establishment and implementation of a National Arctic Research Policy. There are many complicating factors.

a. Alaskan, National and International Interests

Alaska is the only U.S. State in arctic and subarctic territory. An arctic research policy is thus viewed by many as a research policy for Alaska, as a "bonanza" for Alaskan scientists. Many of the "local" technology and "local" specialist requirements are perceived at the federal or national level as of eminently "Alaskan interest", and consequently are expected to be funded mostly from Alaskan sources. In turn, the Alaska state government is reluctant to support specific arctic research programs whose intended beneficiaries are spread over the entire nation. These issues are complicated by the fact that Alaska has a very small constituency nationally and currently is viewed from outside as the richest state (per capita) in the nation. To counter these arguments, of course one should point out that the resource development in the United States arctic and subarctic regions and adjacent waters and the deployment of defense systems at high latitude have become, and will remain, a vital part of our entire nation's economy, trade, and security. After all, the total potentially recoverable undiscovered oil and gas resources in the U.S. Arctic are estimated to be approximately 24 billion barrels of oil and 109 trillon cubic feet of gas, or a total of 44 billion barrels of oil and oil-equivalent gas (National Petroleum Council, 1981); the potential coal reserves in the U.S. Arctic exceed those of the contiguous United States.

On the other hand, it is important to point out that U.S. interests in the Arctic extend far beyond the boundaries of U.S.-territory, waters and air space. We have obvious and vital defense interests in the entire Arctic Ocean, in Northern Canada and in Greenland. We have extensive scientific research interests and are operating complex observatories and research stations in Northern Canada, Greenland and Svalbard. We have vital interests in the international economic and cultural policy issues common to all circumpolar nations and their native people. We are signataries of the Svalbard treaty. And the entire northeastern defense perimeter of NATO lies in the Arctic.

b. The Definition of "Arctic"

This brings us to another complicating factor, namely the definition of the concept "Arctic" in the context of a U.S. Arctic Policy. The Arctic is normally thought of as a geographical region, one that can be defined by geographic coordinates, such as the latitude of the Arctic Circle. In the context of human activity, technology and science, however, the concept of "Arctic" is much broader, and should be defined in an operational way. Indeed, when we talk of "Arctic Policy", we think of it as applied to, or related to, those high northern latitude regions in which cold climate, long winter nights, sea ice, permafrost, ice fog, scarcity of fast surface transportation routes, geomagnetic and auroral perturbations, etc., are all factors that, individually or in concert, impair or prevent the transplantation of "traditional" lifestyles and technologies from lower latitudes. Several recent documents (e.g., the National Petroleum Council Report U.S. Arctic Oil and Gas (1981); Senate Bill No. 1562, The Arctic Research and Policy Act; several National Academy of Sciences reports) give *sui generis* definitions of "Arctic", which differ from each other quite considerably. For the purpose of this discussion, we shall simply define the "Arctic" as those northern regions where human activity, technology, communications and defense systems require special adaptation to cold climate, to the presence of ice in its various forms, or to polar upper atmosphere disturbances.

c. Facts-and-Figures and For-instances

A third factor complicating the establishment of a National Arctic Research Policy is related to the difficulty of estimating the (substantial) cost of *not* having one. Frequently, politicians, the lay public and scientists unfamiliar with arctic research, ask for "facts and figures" about concrete examples of uncoordinated, piece-meal, boom-bust Arctic research endeavors and the related waste of financial and intellectual resources. This is most difficult to provide, mainly because the really significant examples are not easy-to-appraise blockbuster "blunders", but, rather, the myriad of incidents which taken together present a macroscopic configuration whose impact is painfully evident to those who actually perform arctic research, but quite laborious to describe to others. A good account of examples of individual incidents is given in Hickok *et al.* (1981).

d. The Multiplicity and Interdisciplinary Nature of Scientific Goals

Another complicating factor is given by the sheer number of arctic research problems that await solution. In the geosciences alone, we may cite as examples of broad arctic research goals: 1. Acquisition of an adequate data base of key geophysical parameters needed in long-term environmental forecasting; 2. Study of global atmospheric circulation in the Arctic, circumpolar distribution of industrial pollutants and potential climate impact; 3. Study of sea-ice mechanics; 4. Sea-ice forecasting; 5. Study of pollutant dispersion in ice-bearing soils and ice-infested waters; 6. Prediction of polar upper atmosphere disturbances and effects on northern communications and defense systems; 7. Permafrost dynamics, detection and mitigation of effects on structures; 8. Ice-fog dynamics and potential mitigation. To this one must add less site-specific topics, but of great site-specific importance, such as the geology and tectonics of the Aleutian Chain, the Alaskan North Slope, the Arctic Ocean Basin, etc. Similarly extensive lists can be drawn for all other major scientific disciplines.

In addition, the acquisition of scientific knowledge on the Arctic poses some rather specific problems. One is that the scientific questions per se are often very special, requiring scientific specialization and experience that take years to gain. Another is the requirement of complex, unusual and very costly logistic support. A third problem is that physical and biological phenomena in the Arctic have a tendency of crossing disciplinary boundaries, in part due to the strong interactions and delicate equilibria, both physical and ecological, that we find in polar regions. The result of all this is that arctic science is eminently interdisciplinary in nature, that arctic phenomena and processes cannot be studied in isolation, that these studies are very expensive, that the need for coordination is dictated more by logistic considerations than by strictly scientific arguments, that these studies have to compete with more traditional science endeavors at lower latitude, and that they often fall between the cracks of agencies and peoples' frames of mind.

e. The Military-Industrial Complication

Finally, another complicating factor for Arctic Research Policy arises from the restricted dissemination of information on research carried out by two crucial "users" of the Arctic: private industry and the military. Vast applied research needs of industry in the Arctic must be satisfied swiftly, as they emerge. Understandably, however, the private sector has been reluctant to invest large sums in developing local technologies and solving local problems which are common to many northern enterprises. Private firms see little reason why a few should pay while many benefit. Yet if the results of studies of common problems are kept proprietary, there will be repeated and wasteful studies of the same questions. This picture is compounded by an understandable suspicion of private industry, namely, that attempts of national coordination or national policy-setting could lead to greater control and regulation of their own activities. Yet we firmly believe that, quite to the contrary, industry would greatly benefit from an expanded public data base on the arctic environment and arctic processes and that they would benefit greatly from a better and faster conduit to expanded sources of public scientific information. Speaking of control, it is fair to state that the over-regulation that often has plagued industrial initiatives in the Arctic was more the result of scientific uncertainty than the result of over-emphasized environmental concerns.

On the military side, there are obvious reasons why the Department of Defense is reluctant to openly tie its arctic research needs to a public Arctic Science Policy. Yet these needs exist. It is useful to remind ourselves that the United States has never fought a war in the Arctic or under truly arctic conditions, while our principal potential adversary has won several wars with the aid of Arctic conditions. The achievement of satisfactory combat readiness in the Arctic requires the solution of a large number of problems that cannot be studied effectively in the laboratory or in simulated environments, such as the performance of smart weapons under ice-fog conditions or under intense auroral displays; the effects of high-latitude space disturbances on orbital and over-the-horizon surveillance systems; the basing of weapon delivery systems in frozen ground; the effect of snow and permafrost on vehicle and personnel detection devices; radioactive fall-out dispersion in the arctic atmosphere; the construction and operation of underground command posts and power plants in permafrost terrain; chemical warfare in arctic climate; auroral effects on military space systems; protection of the resource extraction systems in Alaska from terrorist seizure or military attack; etc. Of course, a public Arctic Research Policy cannot explicitly address nor include research of Department of Defense incumbency. But a successful policy can help create a research environment conducive to providing the Department of Defense with crucial information, environmental data, basic research results and, above all, expert manpower needed to answer the myriad of relevant technical questions.

3. ELEMENTS OF A NATIONAL ARCTIC RESEARCH POLICY

One of the most difficult tasks in developing a National Arctic Research Policy is to provide for a fair balance between inherently antagonistic interests such as the thrust for profit-guided development and decreased governmental regulation of industry, the concerns for adequate and long-term environmental and cultural protection of the Native People, the concerns for national defense and related protection of information of the military, and the concern for objective, unbiassed and open research of the academic community.

A National Policy should be based on the recognition of two basic facts:

1. The Arctic, particularly Northern and Northwestern Alaska and those portions of the Arctic Ocean and adjacent seas that are of vital concern to U.S. interests, is entering a period of greatly accelerated economic, social, and political change.

2. The United States will be faced with a series of difficult decisions concerning the Arctic, which will require an expanded and sustained body of fundamental scientific knowledge of the Arctic areas and their populations.

A National Policy for Arctic Research should further take into account the following important factors which will bear on, or determine, national decisions concerning the Arctic:

1. The natural resource potential of the Arctic during a time of intense global competition for resources. It is estimated that as much as 50 percent of the total undiscovered oil resources remaining within the jurisdiction of the United States occur in the Arctic (National Petroleum Council, 1981). The U.S. Arctic also contains immense reserves of coal as well as strategic minerals and an extremely valuable marine fishery.

2. The susceptibility of the Arctic environment to man-caused change. Many aspects of the arctic land, freshwater, and marine ecosystems are vulnerable to environmental changes; recovery rates are slow, and some effects can be expected to be long-term. Many of the observations and studies that would assist long-term planning and the minimization of undesirable effects of human activities in the Arctic are not yet available.

3. The effects of technological and developmental changes on the lifestyles, values, and culture of the Native population of the Alaskan Arctic. Alaska is clearly in a difficult period of transition. Although Native groups realize that more changes are inevitable, they wish to thoroughly understand the many ramifications of proposed developmental decisions so that they can achieve a balance of economic and cultural well-being.

4. The strategic location of Alaska and of the Arctic in general. A thorough understanding of the Arctic environment is essential to an effective North American defense posture. Of particular importance are all aspects related to frozen ground, arctic climate, sea ice and the Arctic Ocean, and the upper atmosphere and ionosphere at high geomagentic latitudes.

5. The need and opportunities for international cooperation and exchange of information. Much of arctic research involves the ocean, the atmosphere, and the biological populations--entities that do not conform to national boundaries. Thus it is important to have effective exchange of technical information between arctic nations and to expand the circle of cooperating nations. Yet, the Arctic is still largely untouched by international agreements (Bloomfield, 1981).

Finally, in designing an Arctic Research Policy the following government responsibilities must be recognized:

Resource development--furtherance of efficient, productive developmental activities;

Stewardship of the Land--protection of the environment and the management of resources to achieve long-term public goals;

Cultural Well-being--protection of the native people and their rights;

Defense and National Security--military and international geopolitical considerations;

Scientific Research--support of research that serves as the foundation for arctic science and technology.

The last-listed responsibility is essential to carry out the others, all of which require an adequate data base and quantitative understanding of the physical and biological processes occurring in the Arctic.

4. ARCTIC RESEARCH POLICY STATEMENT

The core of a National Arctic Research Policy should be a clear and unequivocal statement of Federal Government commitment to the support of scientific research in U.S. Arctic territory and in other arctic areas of U.S. interest, as a necessary and integral part of national policies for economic, technical and social development, resource development, environmental protection, national security, and international cooperation in the Arctic.

Such a statement should build on and confirm, in the light of current circumstances, the statement of National Security Decision Memorandum 144 (see p. 3) and take into account the mandates and evolving responsibilities of different federal agencies that have scientific interests and technical missions or programs in arctic regions. The statement of commitment should further point out that:

(a) The sound and rational development and the protection of the arctic regions calls for a stable program of basic and applied research, involving partnership of federal, state, local, and private organizations, as well as planned and coordinated investments in arctic research facilities and management structures;

(b) There is a need to develop a broad information base in the public domain, built on systematically gathered data in a wide range of physical, biological, and social sciences pertaining to the Arctic, and based on an improved understanding of arctic cultures;

(c) There is a need for an expanded national expertise and capability in arctic science and engineering to meet the needs of the future.

The government of the United States should further implement its commitment to the support of arctic research by increasing the coordination and effectiveness of arctic research programs and furthering stability and continuity of effort for arctic research. Suggested actions should include:

(a) The development of a policy-guided federal Arctic Research Plan allowing for the distinctive problems unique to the Arctic;

(b) The preparation of a systematic review of lead-agency functions and responsibilities in areas of field data-gathering and regional surveys, in the light of rapidly evolving needs for scientific data from arctic regions;

(c) The development of a flexible but consistent and comprehensive policy for investment in and management of arctic research facilities.

5. POLICY-GUIDED ARCTIC RESEACH PLAN

The implementation of a National Arctic Research Policy will require a research plan for the next 10 to 20 years. It should be the purpose of such a plan to accomplish the following tasks:

1. Identify and assign priorities to arctic research needs and opportunities in the physical, biological, and social sciences that deserve special national attention.

2. Provide a long-term commitment to arctic research by assigning organizational responsibility for the coordination, management, and funding of a program designed to meet identified high-priority research needs.

3. Identify the relative roles in arctic research of the federal, state, local, private, and university sectors and provide a basis for their involvement in the design and conduct of an Arctic Research Plan. Also, when in the best interest of all concerned, stimulate the development of cooperative, jointly supported, interdisciplinary research programs.

4. Provide for mechanisms and institutional arrangements to obtain an adequate data base concurrently with research on fundamental arctic processes, especially toward improving the prediction of long-term environmental changes associated with arctic resource development.

5. Promote a concerted effort to obtain quantitative understanding of short-term natural and anthropogenic hazards and risks in the Arctic, and improve prediction and prevention capabilities.

6. Provide a clearinghouse mechanism for the timely dissemination of major results and conclusions of public research, nonproprietary private research, and unclassified military research, as well as information on related manpower, facilities, and equipment.

7. Provide continuity and stability to arctic research so that young scientists will enter and remain in professional careers in arctic investigations, thereby providing a cadre of trained and experienced specialists.

8. Stimulate a nationally integrated means for evaluating laboratory and logistics requirements for the conduct of arctic research.

9. Stimulate international cooperation in the solution of problems of common interest to northern circumpolar nations.

6. RECENT DEVELOPMENTS

Two important developments concerning Arctic Research Policy took place recently at the federal level:

1. Section 1007 of the Alaskan National Interest Lands Conservation Act (Public Law 96-487) directed the Secretaries of the Interior, Defense, and Energy to review and make recommendations on (1) the need for redirecting U.S. Arctic research policy, and (2) the role of the Naval Arctic Research Laboratory facilities in developing and implementing that policy. A study was produced (Departments of the Interior, Defense, and Energy, 1982) containing an exhaustive analysis of the relevant issues and formulating multiple proposals to implement courses of action.

2. U.S. Senator Frank Murkowski from Alaska introduced a bill, S. 1562, entitled The Arctic Research and Policy Act of 1981. This bill, co-sponsored by Alaska Senator Ted Stevens and Washington Senator Henry Jackson, provides for the establishment of an Arctic Science Policy Council, an Arctic Research Commission and an Arctic Research Fund, with the participation of federal, State of Alaska and private organizations. Three hearings were held on the bill, which at the time of this writing is awaiting consideration and mark-up by the Senate Committee on Governmental Affairs.

Based on these developments at the federal level and motivated by a long-standing concern over the lack of a comprehensive statement of U.S. Arctic research goals and objectives, the Polar Research Board of the National Academy of Sciences established in 1981 an *ad hoc* Committee on Arctic Research Policy.

This Committee prepared a statement (Main Elements of a National Arctic Research Policy, July 30, 1981), which was adopted by the President of the Academy and submitted to the Departments of Interior, Defense and Energy for consideration in their report (see 1. above). The Academy statement affirms the need for a National Arctic Research Policy, proposes the main elements for such a policy, and points out that any major logistic requirements such as an arctic research laboratory should be determined only in the light of such a policy.

At the same time, the Polar Research Board requested the Committee on Arctic Research Policy to prepare a document entitled A United States Commitment to Arctic Research. During the period May 1981-July 1982 comments and opinions were solicited from many persons in federal agencies, on Congressional staff, in private industry, at State of Alaska institutions, and in the North Slope Borough. Publication of this document is expected soon. Sections 3, 4 and 5 of the present paper are based on recent deliberations of the Committee on Arctic Research Policy.

7. CONCLUSIONS

After years of stagnation and tug-of-war in the development of a National Arctic Research Policy, a positive momentum is beginning to show, especially with the introduction of Senate Bill No. 1562, The Arctic Research and Policy Act. The scientists engaged in arctic research and the main beneficiaries of such research now await concrete action and implementation. They sincerely hope that, as a result, arctic research will be better focussed better coordinated and perhaps even better funded.

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STATEMENT OF UKPEAĠVIK IÑUPIAT CORPORATION
IN OPPOSITION TO S. 1562
THE ARCTIC RESEARCH AND POLICY ACT OF 1982

BY R. C. HARCHAREK, Ph.D.,
DIRECTOR OF TECHNICAL ASSISTANCE

The Ukpeaġvik Iñupiat Corporation is the Alaska Native Claims Settlement Act (ANCSA) Village Corporation for the Iñupiat (Eskimo) people of Barrow, Alaska. With over 2,000 shareholders, UIC is the largest village corporation on the North Slope of Alaska and one of the largest in the entire state. Its shareholders account for approximately 54% of the total native population of the United States Arctic.

Our concerns with the quality of life and the future of the Arctic and our people are real. These concerns with the preservation of our culture and our subsistence lifestyle are intimately woven into our corporate philosophy, which premeates and gives substance to all of our development activities. Our commitment and involvement as a village corporation in the preservation of these values is strengthened by Congressional mandate. In the enactment of ANCSA legislation, many of the responsibilities assigned to the village corporations are based on the theory that the village corporation may be able to maintain the opportunity for a subsistence way of life for some of its members [fn: See H. R. Ref. No. 92-746, Congress, 1st session 37 (1971)].

Regrettably, the Ukpeaġvik Iñupiat Corporation must, at this time, oppose the enactment of S.1562 as subsequently amended, and hereby request the Senate Governmental Affairs Committee not approve this legislation as presently drafted. We have, through our analysis, identified numerous unacceptable discrepancies between S.1562 and its subsequently amended versions. The amended versions of S.1562 make the current legislation untenable.

We represent the indigenous people of the Alaskan Arctic. Our ancestors have occupied this land for many generations. We have, for a long time, recognized the need for a coherent, comprehensive Arctic scientific research policy for the United States. It was for that reason that we supported the introduction of S.1562 on 31 July 1981.

The original legislation struck a proper balance between the need for Arctic research geared toward national defense and resource development activities, while recognizing the need to preserve and protect our cultural values and subsistence lifestyle. We were extremely pleased that the original version of S.1562 expressly provided for genuine consultation with, and input from, the Iñupiat in the decision making process with respect to Arctic research objectives and policy.

Unfortunately S.1562 as subsequently amended, no longer strikes this balance. All references to the Iñupiat and their concerns have been deleted from the present version. Instead, the bill had become a thinly disguised vehicle for research activities designed to promote the commercial exploitation of Alaska's energy and wildlife resources, and national defense activities with apparently little regard for the impacts of these activities on the residents of the Arctic. Unfortunately, as this legislation has proceeded, its original purposes have become some what eroded.

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We do not oppose all national security or resource development activities in the Arctic. However, we must reluctantly oppose S.1562, as amended, since it promotes these activities with the apparent disregard for their effects on the Iñupiat community. Our specific concerns and criticisms of S.1562 include the following:

Sec. 2 - Findings and Purpose: This section of the original version of S.1562 included numerous references to the Native Culture, management of fish and wildlife resources and Native contributions to Arctic research efforts (see Sec. 2 (a), (3), (6), (7), (8) of the original bill). Every one of these references has been deleted in the amended versions of the bill. As far as we know, no native organization on the North Slope was advised or consulted concerning these specific deletions, or the reasons for their being made. However, even the recently published *Report To The Congress on Developing Alaska's Energy Resources* states that "present research efforts are inadequate to evaluate energy-related impacts...[such as] societal impacts, including the curtailment or disruption of native subsistence hunting and fishing..." Instead, the amended bill now focuses on matters such as the commercial exploitation of the Arctic's fisheries resources (see Sec. 2(a) (3) of the amended bill). There is no reference to the needed protection of fish and game or the Native culture. We question both the reason for and the implications of these deletions.

Sec. 4 - Duties of Council: As originally introduced, the bill would have required that the Arctic Research Council solicit the recommendations of, among others, the Native community with respect to Arctic research priorities; keep track of research activities which might impact on the environment or people of the Arctic; and seek to minimize such adverse impacts (see Sec. 4(3), (4) (A) and (B) of

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the original). No such requirements are included in the amended bill. UIC deems it necessary that scientific research efforts catch up to and overtake development activities so that potentially devastating real world problems can be foreseen, addressed, and resolved before irreparable harm is done to our land, our environment, our subsistence reosurces and ultimately to our culture.

Sec. 4 (A) (1) discussed cooperation between the Federal Government and State governments with respect to Arctic research. Conspicious, by its absence, is any mention of the local Native communities or governments.

Concerning Sec. 4 (A) (3) we believe that the specific mechanisms for developing and supervising the activities should be articulated. How is this to be accomplished? With whom? What, if any, would be the involvement of the Arctic residents?

Sec. 6 - Arctic Research Commission: In the original version of S. 1562, an Advisory Committee was established which included representatives of "Native residents of the North Slope of Alaska" (see Sec. 5(3) of original). As now amended, the bill establishes an Arctic Research Commission which provides for membership only of "Arctic residents" (see Sec. 6(b) (1) (B) of amended bill). This change is both signfiicant and indicative of the shift in emphasis which has occurred between the two versions of the bill.

The language neither insures that there will be genuine participation of the Iñupiat people, nor even provides

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for that involvement. Any potential participation of North Slope residents is further neutralized by the revised definition of the Arctic, which will be discussed later in this statement.

Sec. 7 (b) (1) (B): We are puzzled by this language. Is the Commission's annual report to be a public document? If so, why shouldn't it be made widely available to the interested public? This language suggests that only one copy will be available at the Commission's office.

Sec. 11 - Definition of Arctic: As originally introduced, the focus of the bill was on the North Slope of Alaska, defined as that territory north of 68 degrees north latitude (see Sec. 7(a) of original). This definition has been dramatically broadened in the amended bill to include not only the Arctic region of Alaska, but also the Bering Sea and the Aleutian Chain (see Sec. 11 of amended version). This change seems to us to be unwise. The climate, people and problems of Arctic Alaska are not the same as those of the rest of the State. If this bill is designed to deal with the Arctic, it should be so limited. We believe that special interests concerned with energy resource and commercial fishery development in sub-Arctic Alaska will seize upon this broadened definition of "Arctic" to use the limited research funds available for studies that will have no relevancy and offer no benefits to the Arctic.

We are cognizant of the fact that there is no singularly acceptable definition used to delineate the boundaries of the Arctic. Among the more common boundary criteria used to define the Arctic are the Arctic Circle, the tree line, and the limits of sea-ice coverage and perennially frozen ground or permafrost. According to the Central Intelligence Agency's Polar Region's Atlas, "Perhaps the most favored Arctic boundary is the 10°C surface air isotherm for the warmest month (July). This isotherm coincides roughly with the most visible natural boundary - the tree line, which defines the northern limit of trees and the start of the treeless tundra." That definition is more accurate and acceptable than the definition presented in the amendments.

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Sec. 12 - Nonapplicability of NEPA: We are greatly troubled by this provision. If the phrase "any activities conducted pursuant to this Act" is meant to include any research activities conducted in the Arctic, we view this NEPA waiver as far too broad and extremely dangerous. We sincerely hope that the sponsors of this legislation, which includes Alaska's two senators, did not intend to exempt the people of the Arctic from the protections afforded to all other Americans under the National Environmental Policy Act. To do so would be to subject the fragile Arctic environment, and the Native people who depend on it for our very existence, to any and all research activities, no matter how environmentally unsound! This provision, if not deleted in its entirety, must be changed to make clear that the NEPA waiver applies only to the administrative activities of the Council and Commission, and not to the actual research activities which this legislation would promote.

We are particularly concerned with this provision on the exemption of the Arctic Research Act from environmental impact statements. The current wording of the provision could be interpreted to mean, for example, that seismic testiing, which has required such impact statements in the past, would be allowed without those statements if the research were funded under this legislation.

In summary, the Ukpeaġvik Iñupiat Corporation must reluctantly oppose enactment of S.1562 in its present form. While we strongly believe in the need for an Arctic Research Policy, we believe that such a policy must be a balanced and equitable one. The current version of S.1562 tips too far on the side of commercial exploitation of the Arctic's resources. It fails to take into account the needs and concerns of the Arctic peoples. Until the legislation can be satisfactorily amended, we strongly urge the Senate Governmental Affairs Committee's defeat of S.1562.

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BERING STRAITS NATIVE CORPORATION

P.O. Box 1008 • Nome, Alaska 99762 • Phone (907) 443-5252

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Testimony of Bering Straits Native Corporation on
S.1562 "The Arctic Research and Policy Act of 19[illegible]."

By Charles H. Johnson, President
Bering Straits Native Corporation

Our apologies for not being able to participate in the panel discussion at the hearing on April 17, 1982 in Fairbanks. Meetings with our Village Corporation Presidents were scheduled at that time.

Our position is that S. 1562, even though it is limited to the North Slope of Alaska will have vast benefits not only to the people of the North Slope, but to all the Native Corporations and the entire state.

If the only thing that S.1562 did was to mandate a coordinated and cooperative effort by Federal Agencies, the Act would be worthwhile. Too often we see programs by one federal agency that are directly contradictory to the efforts of another. Examples are too numerous and redundant to warrant itemization. The fact that this Act will not only coordinate federal agencies and policies but develop thru a council, programs for the orderly development of the resources and protection of the environment thru research make this Act of great benefit.

The research programs will develop information that is particularly lacking now on how the Arctic can be developed without damaging an environment that is as fragile as the conditions are harsh. The life of the Arctic literally hangs on by a thread and recovery from any damage is a lengthy process at best.

With impending development of oil offshore in Norton Sound and the Bering Sea, we would propose that S.1562 be extended to include all of Northwest Alaska South to the Yukon River. The reasons for including Northwest Alaska are identical to the reasons for having an Act for the North Slope.

The Bering Straits Native Corporation wholeheartedly support S.1562.

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TESTIMONY BY REAR ADMIRAL NORMAN VENZKE, CHIEF, OFFICE OF OPERATIONS, U. S. COAST GUARD

It is indeed a pleasure to provide testimony regarding S. 1562, the Arctic Research and Policy Act of 1982, as amended on September 2, 1982. The Department of Transportation supports the enactment of this legislation. The Coast Guard has been involved in the Arctic ever since the purchase of Alaska in 1867. That same year the Revenue Cutter LINCOLN was ordered north to make the first official U. S. exploration of the new Alaskan territory. The Bering Sea Patrol was commenced soon thereafter, leading to the construction of several "ice-going" cutters. These predecessors to our present fleet of polar icebreakers were able to transit ice-covered Alaskan waters in order to carry out law enforcement and search and rescue missions. Operating in the Arctic is a challenge to the capabilities of both the men and women working in that environment and the ships and equipment which must support them. The Coast Guard over the last century has continuously sought better and safer methods of operating in this region. This includes construction of more capable icebreakers, development of onboard helicopter reconnaissance, training of personnel, and increased utilization of modern technology.

Our polar missions continue today with the added responsibility of operating the only federal icebreakers capable of supporting Department of Defense resupply and logistics efforts and scientific and oceanographic activity in the Arctic. Our recently completed Roles and Missions Study clearly recommended that the Coast Guard continue to operate all U. S. polar icebreakers. It also recommended that the Coast Guard be fully reimbursed by benefitting agencies or organizations for all identifiable costs of polar operations not specifically required for Coast Guard missions, and on a prorata basis for all costs of joint operations. The Roles and Missions Study also stated that the responsibility for routine icebreaking for the facilitation of commerce rests with the marine industry, not the federal government.

It appears the essence of this proposed Act is to "establish priorities and provide financial support for basic and applied scientific research with respect to the Arctic that is essential to our Nation's needs." The Coast Guard will likely be an integral agency in the execution of research sponsored by this Act through provision of icebreakers, aircraft, personnel, and communications on a reimbursable basis.

The Department of Transportation and the Coast Guard possess valuable expertise in Arctic transportation. Currently, for example, the Department of Transportation (Coast Guard and Maritime Administration) is conducting multi-year trafficability studies in the Western Arctic designed to assess the operational feasibility of commercial marine activities in the ice-covered waters of the Bering and Chukchi Seas. The purpose of the trafficability research is to provide environmental and ship-performance data which will permit an evaluation of year-round marine transportation (including offshore structures) in the Alaskan Arctic. This research was undertaken in response to the vast oil and gas reserves estimated in the Beaufort, Chukchi and Bering Seas and the desire to reduce U. S. dependence of foreign energy resources. It is noteworthy that this energy resource potential forms the opening statement in the proposed Act.

Additionally, the Coast Guard icebreakers operating in the Arctic have been essential platforms for the gathering and measurement of environmental factors such as: ecological studies of the Western Beaufort Sea in the early 1970s; whale, walrus and other mammal surveys; the measurement and documentation of encountered weather and ice conditions; and support to the environmental assessment program ongoing along the Alaskan Outer Continental Shelf. The Coast Guard also particiapted in the recently completed National Petroleum Council study "U. S. Arctic Oil and Gas", which was submitted to the Secretary of Energy, as well as on the recent Interagency Arctic Policy Group review.

The proposed Bill, as amended, recognizes the Coast Guard's unique capabilities and Arctic experience through the provisions which provide for DOT and Coast Guard participation on the Arctic Science Policy Council and the Arctic Research Commission. The Coast Guard has a long and distinguished history involving operations in the Arctic and enjoys an enviable reputation of cooperation with other agencies and Alaskan native people. The Coast Guard is committed to continuing this cooperation.

GENERAL COUNSEL OF THE
UNITED STATES DEPARTMENT OF COMMERCE
Washington, D.C. 20230

SEP 10 1982

Honorable William V. Roth, Jr.
Chairman, Committee on Governmental
  Affairs
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

This is in response to your request for the views of the Department of Commerce concerning the proposed substitute amendment to S. 1562, a bill

> "To provide comprehensive national policy dealing with national needs and objectives in the Arctic."

The proposed amendment to S. 1562 would establish an Arctic Science Policy Council (Council), which would be composed of a Chairperson appointed by the President, with the advice and consent of the Senate; two individuals from the State of Alaska appointed by the President from a list submitted by the Governor of the State of Alaska; and two individuals appointed by the President from a list submitted by the Secretaries of Commerce, Defense, the Interior, State, and Transportation (representing the Coast Guard), and the Director of the National Science Foundation.

The duties of the Council would include: facilitate cooperation between the Federal Government and state governments with respect to Arctic Research; coordinate and promote cooperative scientific progams with other nations; develop and supervise an integrated national Arctic science policy; and appoint the members of the Arctic Research Commission. The Commission members will include representatives of the University of Alaska, Arctic residents, representatives of Arctic private industry, and an individual from the United States Coast Guard.

Among the duties of the Commission will be to determine priorities for future Arctic research, promulgate guidelines, and award grants for Arctic research.

The proposed amendment would also create an Arctic Research Fund. The Fund would consist of Federally-appropriated dollars, State of Alaska appropriated dollars, and amounts contributed by private individuals and organizations. Funds would be authorized for fiscal year 1983 and for each succeeding year thereafter at a level of $25 million.

The Department of Commerce supports the proposed amendment to S. 1562. The Department particularly supports the "Findings and Purpose" section of the proposed amendment, which emphasizes concerns for the cost-effective utilization of natural resources and the requirements for research to support national defense.

We have been advised by the Office of Management and Budget that there will be no objection to the submission of this letter to the Congress from the standpoint of the Administration's program.

Sincerely,

Irving P. Margulies
for Sherman E. Unger
General Counsel

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THE SECRETARY OF DEFENSE
WASHINGTON, THE DISTRICT OF COLUMBIA

17 SEP 1982

Honorable William V. Roth, Jr.
Chairman, Committee on Governmental Affairs
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

This is in reply to your request for written testimony on the 2 September 1982 draft amendment to S.1562, 97th Congress, a bill "to provide comprehensive national policy dealing with national needs and objectives in the Arctic." The Department of Defense supports the continued and enhanced emphasis on Arctic research; and, accordingly, we support the enactment of S.1562 as amended by the 2 September draft. The Department's detailed comments are enclosed.

Sincerely,

Enclosure

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THE DEPARTMENT OF DEFENSE COMMENTS CONCERNING
THE 2 SEPTEMBER 1982 DRAFT AMENDMENT TO
SENATE BILL 1562, "ARCTIC RESEARCH AND POLICY ACT OF 1982"

The Department of Defense (DoD) has been and continues to be a major proponent for Arctic research as it pertains to national security. DoD continues to have needs for research in all polar regions; however, our highest priority requirements have shifted from the Alaskan Arctic to the eastern Arctic (east of Greenland) for the foreseeable future. As a major contributor to Arctic research throughout this century, DoD has also been a major participant in the significant cooperative and complementary Arctic research programs and existing coordinating organizations of the Federal research community. Under the framework of this legislation, close coordination and cooperation between the Arctic Science Policy Council (ASPC), the Arctic Research Commission, and existing Federal groups will be necessary.

In the late 60s, the establishment of the Interagency Arctic Research Coordinating Committee (IARCC) under the National Science Foundation (NSF) and the Presidential designation of the NSF as the lead agency for research in the Arctic provided the beginning of a sound framework for coordination of Arctic research. The current U.S. national policy toward the Arctic was established in the early 70s with National Security Decision Memorandum (NSDM) 144. The Interagency Arctic Policy Group (IAPG) established by NSDM 144 remains an effective mechanism around which broad national Arctic policy should be focused. The IAPG was reaffirmed in 1979 and is now managed under the National Security Council Policy Review Committee. It is an active group with broad multiagency participation. In September 1980, the IAPG provided the National Security Advisor a coordinated

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statement of national goals and objectives in the Arctic and in early 1982 began coordination of an expansion of NSDM 144. The ASPC should work in coordination with the IAPG which maintains responsibility for the broader Arctic policy considerations. The NSF IARCC, although no longer formally chartered, has met as recently as April 1982 and continues as an active working group. It provides an excellent coordinating mechanism for Arctic research activities. Also, the Polar Research Board of the National Academy of Sciences serves as an effective forum for coordination of Arctic as well as Antarctic research activities. DoD representatives have been and will continue to be active participants in all of these coordinating mechanisms.

The National and Defense technical information services, the Army sponsored Library of Congress "COLD" Arctic data base (updated monthly), the U.S. World Data Center for Glaciology (snow and ice) along with the Army and University of Alaska Arctic technical libraries provide an extensive capability for complete and easy access to the wide range of Arctic research information, both private and Federal. The creation of a new government Arctic data collection and retrieval center must be done in harmony with these existing well known capabilities to avoid duplication of services.

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Department of Energy
Washington, D.C. 20585

SEP 13 1982

Honorable William V. Roth, Jr.
Chairman, Committee on Governmental
Affairs
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

Secretary Edwards has asked me to respond to your request for the Department of Energy's views on S. 1562, the "Arctic Research and Policy Act of 1982". S. 1562 would establish an Arctic Science Policy Council and an Arctic Research Commission to promote Arctic research, establish a centralized system to collect and retrieve Arctic scientific data, and establish priorities and provide financial support for scientific research of the Arctic.

The Department of Energy supports enactment of S. 1562 as amended by the September 2, 1982 draft.

The Arctic Science Policy Council would facilitate cooperation between States and the Federal government with regard to Arctic research, and coordinate research programs with other nations. The Council would develop and supervise an integrated national Arctic policy, in consultation with the Governor and State of Alaska, publish a statement of goals and objectives with respect to Arctic research, and report its activities and progress to Congress. The Council would appoint members of the Arctic Research Commission.

The Arctic Research Commission would survey all existing Arctic research, establish a data collection and retrieval center for this research, and make grants available to further the goals announced by the Council. The Commission would report to the Council, and submit its recommendations with respect to the continued operation of government-operated laboratory facilities to the Congress and the Alaska State Legislature.

The Council would be composed of five members. The Chairman would be appointed by the President with the advice and consent of the Senate, two members would be appointed from a list of citizens of the State of Alaska submitted by the Governor of Alaska, and the final two members would be appointed from a list submitted by the Secretaries of Commerce, Defense, Interior, State, Transportation (representing the interests of the Coast Guard) and the Director of the National Science Foundation.

Departmental Position

The Department of Energy believes that a coordinated national Arctic research policy could result in significant national benefit. However, the Department recommends a modification be made to S. 1562 so that the bill can achieve its stated purposes more effectively.

Although one of the major justifications for S. 1562 is the need for a coordinated, centralized approach to Arctic energy resource development, the bill fails to include the Department of Energy in implementing this goal. The Department of Energy (or its successor agency) should be one of the agencies responsible for supplying a list of candidates for Presidential appointment to two of the Arctic Science Council positions.

The Office of Management and Budget has advised that, from the standpoint of the President's program, there is no objection to presentation of this report for the consideration of the Committee.

Sincerely,

R. Tenney Johnson

R. Tenney Johnson
General Counsel

cc: Honorable Thomas F. Eagleton
Ranking Minority Member
Committee on Governmental Affairs

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

September 22, 1982

Honorable William J. Roth, Jr.
Chairman, Committee on Governmental Affairs
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

This is in response to your request for the views of this Department on the third revision of S. 1562, the Arctic Research and Policy Act of 1982, an amendment in the nature of a substitute.

The Department has no objection to passage of the bill, in the version dated September 2, 1982.

The Office of Management and Budget has advised that there is no objection to the presentation of this report from the standpoint of the Administration's program.

Sincerely,

William P. Horn

Deputy Under Secretary

DEPARTMENT OF STATE
Washington, D.C. 20520

SEP 14 1982

Dear Mr. Chairman:

The Secretary has asked that I reply to your request for written testimony on the Arctic Research and Policy Act, S. 1562, as amended.

We are pleased to have the opportunity to provide views on the proposed Arctic Research and Policy Act (in its amended form dated September 2, 1982). The Department of State supports enactment of this legislation, though as will be noted we would like to offer several suggested improvements for the Committee's consideration.

S. 1562 addresses an area of unique interest in U.S. foreign policy, an area which tends to be neglected in the press of events in lower latitudes but one of fundamental geopolitical importance to us. The fact that the shortest distance between the American and Soviet heartlands lies along great circle routes across the Arctic is merely the most obvious basis of our interest in the Arctic. Another is the profound influence changing polar ice has upon world weather, and hence, the ability of world grain belts to feed growing populations.

It is obvious that the Arctic has unique characteristics that give it a coherence and that demand that it be treated as a whole. Therefore, we note with approval that the bill as presently revised embraces not only the North Slope of Alaska but also the entire northern cap of our planet above the Arctic Circle, as well as the Bering Sea and the Aleutian Islands. This is a more realistic region in which to deal with issues of Arctic research.

The Honorable
William V. Roth, Chairman,
Committee on Governmental Affairs,
United States Senate.

Although security concerns have driven much of our interest in the Arctic heretofore, it is becoming increasingly apparent that the development of energy resources, both onshore and offshore, will loom large in the future. Due to the impingement of several nations on the Arctic Ocean with its associated passages and seas, and the pattern of water and air movement, development activities by one state will inevitably have repercussions on one or more of the others. We need to know a great deal more about the Arctic to determine the scope and nature of these regional effects. Therefore, encouragement of scientific research in the Arctic is essential, both to expand our general knowledge, and to assure sensible development in this new frontier.

We welcome the initiative of the sponsors of S. 1562 in presenting a bill designed to reemphasize the U.S. commitment to developing a rational program of Arctic research and providing the means to carry this out. From a foreign policy perspective, however, we feel there are several respects in which the bill could be improved to serve national interests.

In the first place, in keeping with enlarging the geographic scope of the bill to include the Arctic as a whole, we feel the policy interest should emphasize broad Arctic scientific problems that extend beyond the borders of Alaska. In this connection, there is perhaps a legitimate need for some fixing priorities and direction of applied scientific research somewhere in the realm between basic science (mainly supported by the National Science Foundation) and development (mainly proprietary inquiry to support the immediate needs of industry).

We will work to avoid any overlap in function with the Interagency Arctic Policy Group (IAPG), which was created in 1971 by National Security Decision Memorandum 144 and the Arctic Science Policy Council established under this bill. NSDM 144 made the IAPG "responsible for overseeing the implementation of U.S. Arctic policy and reviewing and coordinating U.S. activities and programs in the Arctic, with the exception of purely domestic Arctic-related matters internal to Alaska." The Interagency Arctic Policy Group consists of representatives of the departments of State, Defense, Interior, Commerce, and Transportation, as well as the National Science Foundation, the Council of Environmental Quality, and representatives of other agencies, as appropriate. The Department of State was directed to chair the IAPG and provide administrative support and staff. After submitting an initial policy review to the National Security Council, the Group was inactive after 1973. Revived in 1979, the IAPG has undertaken to assess federal actions that might be required in response to anticipated offshore oil and gas development in the North American Arctic. A report on the subject is about to be presented to the National Security Council.

Finally, if centralized direction of our Arctic research is determined desirable -- as some strongly feel it is -- then a more broadly-based policy-making group than the proposed Arctic Science Policy Council is needed. As now proposed, this Council would include only two from among six potential representatives of federal agencies. However, each of these agencies has distinct interests in the Arctic, and in our view they should all be represented on the Arctic Science Policy Council. Enlarging the Arctic Science Policy Council would, furthermore, facilitate coordination of all U.S. Arctic research and the promotion of scientific cooperation with other friendly nations in the Arctic.

The Office of Management and Budget advises that from the standpoint of the Administration's program there is no objection to the submission of this report.

Sincerely yours,

Powell A. Moore
Assistant Secretary for
Congressional Relations

SEPTEMBER 9, 1982

United States General Accounting Office
Washington D.C. 20548

Prepared Statement
for the Record of

Douglas L. McCullough, Deputy Director
Energy and Minerals Division

Before the
Committee on Governmental Affairs
United States Senate

on

Arctic Research Bill, S.1526

MR. CHAIRMAN AND MEMBERS OF THE COMMITTEE:

THANK YOU FOR INVITING US TO DISCUSS THE ARCTIC RESEARCH PORTION OF OUR JUNE 17, 1982, REPORT TO THE CONGRESS, "DEVELOPING ALASKA'S ENERGY RESOURCES: ACTIONS NEEDED TO STIMULATE RESEARCH AND IMPROVE WETLANDS PERMIT PROCESSING" (EMD-82-44).

ALASKA'S FEDERAL LANDS ARE OF UNIQUE IMPORTANCE TO THE NATION'S ENERGY FUTURE. THE WILDLIFE, SCENIC, AND RENEWABLE RESOURCES OF THESE LANDS CONSTITUTE ASSETS OF SINGULAR NATIONAL VALUE. CONSEQUENTLY, ENVIRONMENTALLY SOUND ENERGY DEVELOPMENT IS IN THE NATIONAL INTEREST.

ARCTIC OIL AND GAS OPERATIONS MUST BE SUITED TO HARSH CLIMATIC CONDITIONS AND BE PROTECTIVE OF THE FRAGILE ARCTIC ENVIRONMENT. AT TIMES, IMPACT MITIGATION MEASURES WHICH ARE REQUIRED ARE UNPRECEDENTED, REFLECTING A RESPONSE TO OPERATING IN AN ENVIRONMENT ABOUT WHICH LITTLE IS KNOWN.

WE EXAMINED THE ADEQUACY OF RESEARCH RELATED TO IMPACT MITIGATION MEASURES, INCLUDING THE CONTROVERSIAL AND COSTLY REQUIREMENT THAT DRILLING BE LIMITED TO WINTER MONTHS. WE ALSO EVALUATED THE

ADEQUACY OF RESEARCH AS IT PERTAINED TO IMPACT MITIGATION ON THE NATIONAL PETROLEUM RESERVE - ALASKA (NPRA), THE ONLY FEDERAL LAND NORTH OF THE ARCTIC CIRCLE WHICH HAS BEEN SUBJECT TO SIGNIFICANT ENERGY ACTIVITY. ADDITIONALLY, THE NEED FOR RESEARCH TO EVALUATE THE LONG-TERM ENVIRONMENTAL IMPACT OF PIPELINE DEVELOPMENT WAS ADDRESSED IN OUR JANUARY 1981 REPORT ENTITLED "TRANS-ALASKA OIL PIPELINE OPERATIONS: MORE FEDERAL MONITORING NEEDED" (EMD-81-11, JANUARY 6, 1981). WE FOUND THAT MORE RESEARCH IS NEEDED TO JUDGE THE EFFECTIVENESS OF IMPACT MITIGATION REQUIREMENTS. SINCE THESE REQUIREMENTS CAN MAKE ENERGY EXPLORATION MORE COSTLY AND LESS TIMELY, THEY SHOULD BE APPLIED JUDICIOUSLY. GATHERING OF SITE-SPECIFIC DATA TO ALLOW APPLICATION ON A CASE-BY-CASE BASIS, FOLLOWED BY IMPACT-RELATED RESEARCH TO FURTHER REFINE THE REQUIREMENTS, IS NEEDED.

OUR FINDINGS ARE ALSO BORNE OUT BY OTHER STUDIES. FOR EXAMPLE, ACCORDING TO THE BUREAU OF LAND MANAGEMENT'S SEPTEMBER 1981 ENVIRONMENTAL ASSESSMENT OF THE NPRA FEDERAL OIL AND GAS LEASE SALE, EXISTING RESEARCH IS NOT ADEQUATE FOR TRACT-SPECIFIC MANAGEMENT. THE ASSESSMENT CONCLUDES THAT ADDITIONAL TRACT-SPECIFIC INVESTIGATIONS DESIGNED TO FILL DATA GAPS ARE NECESSARY, AND LISTS STUDIES WHICH RESOURCE SPECIALISTS HAVE PROPOSED.

IN OUR REVIEW OF RESEARCH RELATED TO THE SEASONAL DRILLING RESTRICTION, WE FOUND THAT FURTHER RESEARCH COULD PROVIDE A BASIS FOR MODIFYING THE RESTRICTION. SUCH RESEARCH SHOULD BE CONTINUOUS, IN ORDER TO RESOLVE THE MANY FACETS OF THE ISSUE IN A SCIENTIFICALLY ACCEPTABLE MANNER. THE TYPE OF STUDIES MOST USEFUL TO PRACTICAL DECISIONS NEEDS TO BE CAREFULLY ASCERTAINED.

IN GENERAL, RESEARCH CAN PROVIDE SCIENTIFIC EVIDENCE WITH PRACTICAL APPLICABILITY. IN SOME CASES STIPULATIONS CONTROLLING DEVELOPMENT MIGHT PROVE TO BE UNNECESSARILY RESTRICTIVE, AND CONSEQUENTLY COULD BE RELAXED. IN OTHER INSTANCES, NEW OR ADDITIONAL MEASURES MIGHT BE IN ORDER.

WITH REGARD TO NPRA, WE FOUND THAT MORE ENVIRONMENTAL IMPACT RESEARCH IS NEEDED. FOR EXAMPLE, LONG-RANGE RESEARCH REGARDING IMPACTS UPON SUBSISTENCE FOOD RESOURCES, INCLUDING ARCTIC CARIBOU POPULATIONS AND FISHERIES, NEEDS TO BE DONE.

OUR REVIEW OF ENERGY-RELATED RESEARCH QUESTIONS IN ALASKA BEGAN WITH THE TRANS-ALASKA PIPELINE REPORT. THAT REPORT CALLED FOR ADDITIONAL RESEARCH TO DETERMINE THE LONG-TERM ENVIRONMENTAL IMPACT WHICH PIPELINE ACTIVITY HAS HAD. THESE VIEWS ALSO ARE CONSISTENT WITH RESULTS FROM A U.S. ARMY COLD REGIONS RESEARCH AND ENGINEERING LABORATORY/UNIVERSITY OF ALASKA ENVIRONMENTAL WORKSHOP, WHICH STATED AS FOLLOWS:

> "LONG-TERM MONITORING THROUGH ROUTINE COLLECTION OF DATA FOR POST-CONSTRUCTION BASELINE PROGRAMS SHOULD BE PART OF ANY LARGE PROJECT. UNFORTUNATELY, ONCE A PROJECT IS COMPLETED, THERE IS LITTLE INTEREST OR FUNDS AVAILABLE TO INSURE CONTINUED MONITORING. POST-CONSTRUCTION IMPACTS CAN BE ONLY ASSESSED THROUGH APPROPRIATE MONITORING AND ANALYSES PROGRAMS."

IN COMMENTING ON OUR TRANS-ALASKA PIPELINE DRAFT REPORT IN NOVEMBER 1980, BOTH THE FISH AND WILDLIFE SERVICE AND THE GEOLOGICAL SURVEY AGREED WITH OUR FINDING THAT STUDIES TO EVALUATE THE LONG-TERM ENVIRONMENTAL CONSEQUENCES OF PIPELINE ACTIVITY ARE NEEDED. THE FISH AND WILDLIFE SERVICE AND GEOLOGICAL SURVEY CONFIRMED THE NEED FOR THE TYPE OF STUDIES SPECIFIED IN OUR REPORT, AND STRESSED THE NEED FOR ADDITIONAL ONES. GEOLOGICAL SURVEY STATED THAT:

> "ONE FINDING OF THE STUDY MERITS SPECIAL EMPHASIS: A PROGRAM OF CONTINUING RESEARCH IS LACKING AND IS REQUIRED TO ASSESS LONG TERM IMPACTS OF THE PIPELINE ON THE ENVIRONMENT AND TO OBTAIN DESIGN INSIGHTS FOR FUTURE DEVELOPMENTS IN THE ARCTIC AND SUBARCTIC."

IN THE PIPELINE REPORT, WE RECOMMEND THAT THE SECRETARY OF THE INTERIOR DIRECT THE AUTHORIZED OFFICER (THE INTERIOR OFFICIAL RESPONSIBLE FOR PIPELINE MONITORING) TO ESTABLISH A LIST OF PRIORITY RESEARCH REQUIREMENTS NECESSARY TO EVALUATE THE LONG-TERM ENVIRONMENTAL IMPACT OF PIPELINE ACTIVITY, AND TO CONDUCT SUCH STUDIES, OR ARRANGE TO HAVE THEM CONDUCTED. IN DECEMBER 1981, THE AUTHORIZED OFFICER RECOMMENDED 22 RESEARCH TOPICS TO THE BUREAU OF LAND MANAGEMENT'S ALASKA STATE DIRECTOR, STATING THAT:

> "...WE HAVE LISTED TOPICS WHERE NEW INFORMATION WILL BE NEEDED TO MAKE LAND MANAGEMENT DECISIONS IN THE NEXT FIVE TO TEN YEARS."

NONE OF THIS RESEARCH WAS FUNDED.

OUR NEW REPORT FURTHER SUBSTANTIATES THAT RESEARCH GAPS CONTINUE TO EXIST--THAT ADDITIONAL STEPS MUST BE TAKEN. PRESENT RESEARCH IS INSUFFICIENT TO EVALUATE THE CONSEQUENCES OF ENERGY-RELATED ENVIRONMENTAL IMPACT ON ALASKAN FEDERAL LANDS. WITHOUT THIS EVALUATION THERE IS NO ASSURANCE THAT COSTLY MEASURES WHICH HAVE BEEN APPLIED TO REDUCE THIS IMPACT HAVE BEEN EFFECTIVE. ARCTIC RESEARCH ITSELF IS EXPENSIVE AND SHOULD BE CAREFULLY PLANNED. ADOPTION OF LEGISLATION, SUCH AS THAT UNDER CONSIDERATION BY THIS COMMITTEE, WHICH WOULD PRIORITIZE, FUND, AND COORDINATE ARCTIC RESEARCH WOULD HELP FILL THE RESEARCH GAPS IDENTIFIED IN THIS AND OTHER REPORTS.

MR. CHAIRMAN, THIS CONCLUDES MY STATEMENT.

Hold for Release
Until June 17, 1982

Statement of
Dr. Shelby G. Tilford
Office of Space Science and Applications

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

before the
Committee on Governmental Affairs
United States Senate

Mr. Chairman and Members of the Committee:

Thank you for the opportunity to describe NASA's research efforts in Alaska in conjunction with the Committee's consideration of S. 1562, the Arctic Research and Policy Act. NASA defers to the Department of Defense and the Department of the Interior for specific comment on S. 1562.

NASA's Environmental Observation Division of the Office of Space Science and Applications is actively involved with arctic and sub-arctic research. We provide substantial support directly or indirectly to the University of Alaska directed toward understanding the solar-terrestrial relationship, i.e., the emission of particles and photons from the sun, their history in space, their interaction with and effect on the geospace environment (the Earth's magnetosphere, ionosphere and atmosphere). The favorable location of the University of Alaska permits studies of the aurora and numerous aurorally associated phenomena -- including particle fluxes entering the upper atmosphere, magnetic storms and substorms and their effects on electric distribution lines and oil pipe lines, ionospheric disturbances and their effects on radio communications, infrasonic waves, and wind systems in the upper atmosphere. Basic research support (about four million dollars in FY 1982) is provided in the form of grants to individual investigators and participation of scientists in sub-orbital and orbital flight programs. So far this fiscal year we have supported thirteen rocket launches from Poker Flat Research Range and another seven launches from other auroral rocket sites. Presently, investigators are participating in ongoing flight programs including the International Sun-Earth Explorer (ISEE) Mission, Atmosphere Explorer (AE), Dynamics Explorer (DE), Voyager and Pioneer 10 & 11. Investigators from the University of Alaska have been selected for participation in the Upper Atmosphere Research Satellite (UARS) experiments activity, the Origins of Plasmas in the Earth's Neighborhood (OPEN) Mission, the Shuttle Space Science Missions and the Galileo Mission.

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These high latitudes are of such great interest because of their relative accessibility to the more active regions of the Earth's magnetosphere. Here, the configuration of the Earth's magnetic field is such that it is nearly vertical to the Earth's surface, so that the charged particles that are trapped on these field lines can, under the right conditions, precipitate into the atmosphere. These precipitating particles are responsible for the aurora that can often be seen in the Alaskan sky as well as for other interesting and important phenomona. In fact, at latitudes above the arctic circle, there is a region in the magnetosphere known as the polar cusp where nearly unmodified solar wind plasma can gain access directly to the atmosphere.

The importance of these auroral studies can hardly be underestimated. The understanding of plasma phenomena with all of the complications of wave particle interactions, currents and the resulting plasma instabilities may help in eventually solving the problems associated with laboratory plasma confinement which is a significant problem in the controlled fusion energy area. It now seems likely that molecules produced in the auroral thermosphere are important in the global ozone balance. The enhanced auroral ionosphere is used to reflect high frequency (HF) radio waves that are the principal means of communications in the polar regions as well as the mechanism by which over the horizon RADAR works. For this reason it would be of great value to be able to predict the behavior of the aurora and to know in advance of the onset of disturbances such as magnetic substorms and storms. The magnetic disturbances that accompany magnetic substorms and storms are sometimes sufficient to disrupt power distribution, even at lower latitudes, and it would be useful to predict these events.

There are, for these reasons, many distinct types of studies that can be performed from and about these regions.

- The plasma (electrified gas) environment of the ionospheric and magnetospheric polar region many times provides a better opportunity to study basic plasma phenomena and processes than in the laboratory.

- The large energy input into the upper atmosphere due to particle precipitation and to ionospheric currents causes the formation of molecular species that are unique to the polar regions.

- Locally, these same particles and currents cause a greatly enhanced ionosphere which allows for an understanding of dynamic ionospheric processes.

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- The ionospheric currents drive upper atmospheric winds and circulation which are unique to the region.
- These same currents cause large and rapidly changing magnetic fields which induce large currents in conductors (pipe lines and power lines) on the surface of the Earth.
- The aurora itself is an interesting and not completely understood phenomena which acts as a diagnostic tool for understanding the physical processes occurring in the atmosphere, ionosphere and the magnetosphere.

The solar terrestrial research effort presently supported by NASA is international in scope. Most of the major scientific thrusts in solar terrestrial research require a global viewpoint. This requires participation of a number of countries in both satellite-based and ground-based research programs. The auroral regions play a significant role in these research activities and should continue to coordinate the programs with the national and international scientific communities. Any new initiative for arctic research should not replace the international cooperatives now functioning but should be an addition to them.

With these widely diverse sources of data, both ground-based and satellite-based, an effective coordination and dissemination of data sets is essential. The National Space Science Data Center (NSSDC) of NASA and the EROS Data Center (EDC) of United States Geologic Survey (USGS) are the primary archival centers for the scientific data collected from spacecraft. Such archives ensure that the data sets are preserved for future use. Equally important goals of the data centers are to catalog and distribute data for use in the near term by both scientists and other users (e.g., operational agencies, educational groups and commercial vendors).

If polar region research is to be pursued, an adequate data archival and dissemination system must be included as an integral part so that data can be made available to the general scientific community in a timely and efficient manner. Research data handled in this manner will become a valuable national resource.

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NATIONAL SCIENCE FOUNDATION
WASHINGTON D.C. 20550

September 13, 1982

nsf

OFFICE OF THE
DIRECTOR

Honorable William R. Roth, Jr.
Chairman
Committee on Governmental Affairs
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

I am pleased to respond to your letter of September 2 on behalf of the National Science Foundation and to provide comments pertinent to Senate bill S.1562, the Arctic Research Policy Act of 1982 as amended.

The National Science Foundation has long been active in the support of research in both polar regions. In response to a national policy decision, the Foundation established a small Arctic Research Program in 1971 in recognition of the need for special attention to this important geographic region. Over the years it has been a stable program in terms of the level of research activity supported. This program has served to augment, not supplant, other Foundation support of research in the Arctic through our programs of support of research in the various scientific disciplines such as physics, chemistry, geology, oceanography, etc. Indeed, for several years now the disciplinary programs' support of research in the Arctic has equalled the budget of our dedicated Arctic Research Program, roughly doubling the Foundation's research program in this important region beyond what one would recognize by looking at our budget request to Congress. We believe this duality of support within the Foundation is an element of strength. On the one hand, it demonstrates that Arctic research has high scientific merit and can compete successfully without need for special protection. On the other hand, high quality research projects having unusual support requirements that cannot easily be funded under the disciplinary programs do have a special opportunity for Foundation support under the Arctic Research Program. That is not to say that the Arctic Research Program consists of hand-me-down proposals. Rather, the scientific community has been willing to submit quality proposals to the Arctic Research Program that, because of unusual requirements, it would not have proposed to the disciplinary programs. Three examples of such projects are mentioned below. We believe that the establishment of an Arctic Research Program in the Foundation has served its intended purpose of extending significant opportunities for Arctic research.

In fiscal year 1981, the Foundation's obligations for polar research were approximately $28 million and included some 287 projects of which 142, or about half, were conducted in the Arctic. For clarification, it should be noted that many polar science questions are bi-polar in nature and benefit from pursuit in both polar regions. It also should

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be noted that polar research, especially in the Antarctic, must absorb the infrastructure costs that are available at nominal cost in the other regions of the world, and this makes it difficult to isolate the true cost of polar research. There is no question of the importance of research in both polar regions to the long-range goal of understanding the world we live in. The Foundation's record in sponsoring such research is, I believe, very good. And I am confident that the Foundation will continue a responsible and significant level of scientific research in the polar regions.

The Foundation, at the request of the President's Science Advisor, convenes three or four times a year an informal meeting of program managers representing all Federal agencies having an interest in Arctic research. These meetings provide an opportunity for agencies to keep informed of each others' Arctic research program problems and plans. Additionally, this informal group considers opportunities for international exchange and cooperation; this fall, the group will participate in its sixth meeting since 1970 with our counterparts in Canada. There are sometimes identified research efforts that can be pursued effectively and to mutual advantage under a cooperative arrangement among several agencies or several nations; there are also cases where government and industry collaboration proves to be effective. Given the diversity of objectives among the several interested parties to such collaboration, however, each effort must be judged on its merits according to several sets of criteria. The work of the Council and Commission to be established under the Arctic Research and Policy Act of 1982 (S. 1562) will undoubtedly alter and enhance this coordination process.

The Foundation has had a long-term commitment to coordinated Arctic research projects. Three of our major efforts are described below. Plans were begun in 1968 for the Foundation to collaborate with 3 other agencies to conduct the Arctic Ice Dynamics Joint Experiment (AIDJEX) from 1970 to 1976; the AIDJEX results are proving directly useful to the mission agencies and industry and may suggest new opportunities for scientific research in the future. Upon completion of that effort, the Foundation redirected a significant portion of its Arctic Research Program resources to support a major marine study of the Processes and Resources of the Bering Sea Ecosystem (PROBES). This project is yielding exciting scientific results and will provide new information that will assist management decisions on this important fishing ground for fin fish and crabs specifically, and for decisions regarding management of coastal shelf fisheries generally. These scientific results will likely also prove useful in implementation of the recently concluded Convention on the Conservation of Antarctic Marine Living Resources. Also recently, the Foundation has supported the Greenland Ice Sheet Program (GISP) in which scientists from the United States, Denmark, and Switzerland succeeded in drilling a hole over 2000 meters deep in the ancient ice of Greenland. The ice core retrieved from that hole is being cooperatively analyzed by laboratories in all three countries and will provide unique data on the evolution of our climate since the last ice age.

With particular reference to the provisions of this bill, the Foundation strongly supports the need for a continued steady level of research in the polar regions balanced among the relevant scientific disciplines, and we recognize the continuing need of mission agencies to pursue research and development projects essential to their mission performance. The additional input on desired emphases and priorities for Arctic research that would be provided by the proposed Council will undoubtedly assist the several mission agencies to design their contributions to Arctic research while, at the same time, preserving the essential pluralism of Federal agencies' existing Arctic research programs.

The data archiving and dissemination function suggested in this bill may pose some very difficult problems, and will require careful definition to mesh with and avoid duplication of existing systems including, among others, the several components of World Data Center A and the National Technical Information Service. The National Academy of Sciences has devoted considerable attention to the growing problem of data management, and has over the past decade issued several reports. These reports could provide some useful guidance for the proposed Commission.

In closing, I would like to express on behalf of the National Science Foundation our support for the Arctic Research and Policy Act of 1982, as amended on September 2, and to pledge that we will cooperate with the proposed Council and Commission when they have been established. The Office of Management and Budget has advised that there is no objection to the presentation of this report from the standpoint of the President's program and supports the passage of this bill.

Sincerely yours,

John B. Slaughter
Director

ALASKA BUSINESS UTILITIES
WILLIAM H. DUBAY
4221 WARWICK DRIVE
ANCHORAGE, ALASKA 99504
(907) 279-3349

20 May 1982

Senator Ted Stevens
127 Russell Senate Office Building
Washington, D.C. 20510
Attention: Tonja Musko

Dear Senator Stevens:

I thank you for your invitation to submit testimony on S. 1562, the Arctic Research and Policy Act.

I attended the Fairbanks hearing on this bill and, like you, was quite surprised at the uncooperative and aloof position taken by the Alaska Oil and Gas Association. The Bill itself seemed to be written mostly with the concerns of industry and Arctic development in mind. And no one has profited more than industry from the past involvement of government in Arctic research and study. I feel their position was short-sided and ill-advised from industry's standpoint. Their reservations about the bill (we all had reservations) did not justify their complete refusal to support it.

I am a media and communications consultant in Anchorage, and for the last five years have edited the Arctic Coastal Zone Management Newsletter the North Slope Borough. My comments about the proposed Act briefly have to do not with what the Act covers, but what it doesn't cover.

The first problem may be the most important one that should be addressed by the federal government as it approaches the problems of development of an Arctic policy. At a time when all Arctic nations are embarking on new development in the Arctic, the U.S. is lacking an international policy demanded by this international activity. Without firm agreements among the national participants on matters relating to "Who owns the Arctic?" many of the U.S. industrial objectives are jeopardized.

While the other Arctic nations support and defend the "Polar sector theory" of Arctic jurisdiction, the U.S. goes it alone in supporting an outdated and legally unworkable "high seas" theory, in which the wealth of the Arctic belongs to all nations. Because of this difference in basic philosophies, the U.S. is unable to resolve important boundary disputes with the U.S.S.R. and Canada. The Canadian dispute involves highly-valued Beaufort Sea oil reserves.

Because of its "high seas" philosophy, the U.S. has, in fact, abandoned exploration of the Arctic to the U.S.S.R. and Canada. So aggressively are the Soviets persuing their large sector of the Arctic that it is regarded today as a Soviet lake. I propose that the U.S. claim its "sector" of the Arctic, thereby giving it a much firmer position from which to discuss other important issues with other Arctic countries. The present U.S. policy puts the country at an extreme disadvantage, for example, in such issues as passage of Arctic oil and gas tankers. Other countries are not so naive as to declare their territorial waters "high seas."

The proposed bill passes over completely the issue of self-government and the development of homerule in the Arctic. It has been the position of the ICC and the leadership of the North Slope Borough that this should be among the first objectives of the U.S.: to insist that all Native peoples of the Arctic be given their land claims settlements and the advantages of self-government before any further development take place.

The claims of aboriginal rights of Inuit groups to Arctic territories are internationally recognized. The settlement of their land claims --which has yet to be accomplished in Canada -- should be considered as part of the question of who owns the Arctic, which must be solved before other parties be permitted to develop the Arctic. If you are to bring anything peculiarly American to Arctic Policy and to this bill, it should be a good ole American insistence that the time for colonialization in the Arctic, as anywhere else, is long past. The Senate could certainly recommend the settlement of Canadian land claims as a priority Arctic issue that must be resolved before other cooperative actions are taken.

If we have learned anything from the land claims here in Alaska is that it has facilitated and opened up the North to industry, not block it. Nothing will aid the safe and orderly development of the Arctic more than a good dose of democracy for all Arctic peoples.

While I share these reservations with many others regarding the Bill, it nonetheless has my full support. If there is anything we have learned from history, it is that scientific resolutions of various environmental and technical problems before we engage in massive expenditures has saved industry and the U.S. consumer millions, if not billions, of dollars. When these questions are not adequately answered, on the contrary, court suits are filed, unnecessary risks are taken, environmental damage occurs, and all suffer accordingly. The Bill gives full support to the policy of clearly working out problems before they occur. To act otherwise, especially in the Arctic, is stupid and enormously wasteful.

Industry is always touting its record of safety in the American Arctic, but it fails to give due credit to the excellent regulatory controls in place which allowed this to happen. Without adequate research and technical knowledge, however, such controls will be wasteful and costly. When adequate knowledge is available, controls are not too much nor too little: we know where the balance is. If anything supports the passage of this bill, it is the record of Arctic safety, and the government involvment in Arctic research that made it possible.

I thank you for this opportunity to address this issue.

Sincerely,

William H. DuBay

William H. DuBay
Alaska Business Utilities

Alaska Oil and Gas Association

AOGA

505 W. Northern Lights Boulevard
Suite 219
Anchorage, Alaska 99503
(907) 272-1481

June 18, 1982

The Honorable Frank H. Murkowski
U. S. Senate
Dirksen Senate Office Building
1st & Constitution Ave., N.E.
Washington, D.C. 20510

Dear Senator Murkowski:

RE: Senate Bill 1562

We would like to express our appreciation for the changes, recommended by the Alaska Oil and Gas Aassociation, that were incorporated into the latest draft of Senate Bill 1562, the Arctic Research Bill.

Of particular concern to industry was the provision in the original bill that would have required a permit applicant to fund specific Arctic research that was unilaterally deemed necessary by the permitting agency. We are gratified that it has been removed from the bill.

In AOGA's view the expanded scope of the bill to include all Arctic Oceans bordering Alaska north of the Aleutian Chain; the restructuring of the Arctic Science Policy Council to include members knowledgeable in the field of Arctic Science; and the modification of the Arctic Research Commission membership to include industry representation are considerable improvements in the redrafted bill.

The desirable aspects of the bill notwithstanding, in view of the large amount of arctic research currently underway by industry and academia, there is a residual feeling in the industry that an appropriation of up to $50 million dollars in federal funds for arctic research in these times of budget deficits is premature.

Council and Commission duties should initially be confined to coordination collection and dissemination of ongoing research. Funding for such a role would require a considerably smaller appropriation than the levels currently proposed.

Sincerely,

William Hopkins

WILLIAM W. WOPKINS
Executive Director

WWH:mk
bcc: David Freer
      LPRC (FYI)

Alaska State Legislature
House of Representatives
Albert P. Adams
Chairman
Committee on Finance

Official Business

WHILE IN SESSION
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Juneau, Alaska 99811
(907) 465-3706

HOME - DISTRICT 21
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(907) 442-3320

May 14, 1982

Senator William V. Roth, Jr.
Chairman
Committee on Governmental Affairs
Room 3306
Dirksen Senate Office Building
Washington, D.C. 20510

Dear Senator and Committee Members:

The Senate Governmental Affairs Committee has been considering S. 1562 since its May 7, 1982 hearing in Fairbanks. I was unable to attend that hearing, but I would like to express my support for the concepts contained in the bill.

My election district includes the North Slope Borough and the Northwest Arctic Native Association area (Kotzebue Sound Kobuk River Valley and Noatak River Valley). This makes up over half of the area of the United States above the Arctic Circle.

A great deal of controversy has accompanied the development of petroleum resources in this region, particularly offshore oil reserves. Oil development has the potential for being very destructive to the habitat and animals on which the Inupiat depend to meet nutritional, cultural and social needs. In order to reduce the danger, a concerted effort must be made by all concerned, to gain the knowledge and engineering expertise necessary to reduce the potential for oil spills and improve clean up capabilities.

The environmental impacts, and effects of oil development on the Inupiat culture are two of many areas in which additional research is needed to insure that the Inupiat have the opportunity to maintain their culture, that arctic development progresses wisely, that national defense is strenghtened, and that human knowledge, generally, is expanded. In order to do this effectively and with the greatest return on our investment, we need a mechanism to coordinate the efforts of all parties conducting circumpolar research in the arctic. We need to cooperate, even pool resources, on projects where various parties have similar interests.

The State of Alaska has a council to pursue state research priorities and advise the state legislature on scientific matters. The Alaska Council on Science and Technology was established by statute in 1978. It brings together experts from all over the world to assess the needs for research in order to implement state goals wisely and cost effectively. They have suggested priority research projects in the areas of agriculture, rural education, Alaska's energy resources, mineral development, natural hazards and seismology.

I find the work of ACST exciting and look forward to the possibility that the federal government will begin similar efforts to coordinate its research projects in the arctic. I look forward to close cooperation between the state, local and federal government in areas of mutual concern, in a manner that brings in industry, Native groups, and universities as partners in research and advisors.

Although I strongly support S. 1562, I would like to suggest a few changes in the organizational structure it sets up. As outlined by S. 1562, only representatives of the federal government would have decision making power on the Arctic Research Council. The State of Alaska, industry, Native Alaskans and universities would serve in an advisory capacity only. In addition to this problem, the Council should be made up of lower level officials. The secretaries are much to busy to give the Council the time and energy it takes to achieve its goal of aggressively pursuing scientific research within the context of a policy framework. I would suggest that the federal representatives be officials with enough authority to make decisions, have the hear of the secretaries, and enough time to devote to the Coucil to really make it effective. The state of Alaska must have full voting privileges on all joint operations, in proportion to the financial contribution we make.

I would like to emphasize my support for joint state/federal operation of the NARL facility in Barrow. Although the top research priorities have shifted away from the Barrow area, the facility remains valuable as a base for research which can be conducted there, and as a clearinghouse for research reports by federal agencies, the State of Alaska, and others. In addition, the focus of arctic research could very well shift back to the Barrow area in years to come.

One problem with the NARL facility is its high operating and maintenance costs. These can be reduced through consolidation and upgrade of the facility. I believe that once various departments and agencies of the federal government begin to conduct research within a policy framework, their usage of the NARL facility should increase. The resulting increase in federal financial support may reduce the cost of using the facility to university research teams and Native groups. We could therefore look forward to full utilization of the facility.

I introduced a bill in the Alaska House of Representatives this year which would provide for state operation of NARL. I have not pushed the bill this session because I felt the state should wait to see what direction the federal government will take. I therefore hope for favorable action on S. 1562 this year, and I look forward to pursuing Alaska's end of the bargain again, in the next session of the Alaska Legislature.

Sincerely,

Albert P. Adams

Albert P. Adams, Chairman
House Finance Committee

APA/wlr

ARCO Alaska, Inc.
Post Office Box 360
Anchorage, Alaska 99510
Telephone 907 277 5637

June 11, 1982

The Honorable William V. Roth, Jr.
Chairman
Senate Committee on Governmental Affairs
U. S. Senate
Washington, D.C. 20510

Dear Mr. Chairman:

ARCO Alaska, Inc., Exploration Operations, appreciates the opportunity to submit our testimony to the Committee on Arctic Research Policy outlined in Senate Bill 1562, as amended.

We recognize the need for a consistent and continuing research program to meet not only industry needs, but also state and federal government demands for basic research. The program set up in Senate Bill 1562, however, is not the best one for encouraging Arctic research. Although it addresses legitimate concerns about coordinating and prioritizing activities, this bill creates a bureaucratic layer that could, contrary to the bill's intent, stifle new research projects. We encourage the members of this Committee to consider the research activity already underway before establishing and funding a system to deal with Arctic research.

Currently, state and federal governments, academic institutions, and industry groups conduct extensive and varied Arctic research projects. Funding for the Arctic research is provided through both public and private means. Examples of governmentally funded projects are the Outer Continental Shelf Environmental Assessment Program (OCSEAP), performed by NOAA and supervised by the BLM, and the Cold Regions Research and Engineering Laboratory (CRREL) funded by the Corps of Engineers.

The University of Alaska, Fairbanks, has performed a considerable amount of Arctic research. The faculty consists of many Arctic research experts who have kept pace with recent studies as well as technological advances. Studies on permafrost, sea ice strength, and marine resources have been conducted at the University lately.

Industry's role in Arctic research has been strong. Over 180 industry-sponsored projects through the Alaska Oil and Gas Association (AOGA), have studied problems involving ice mechanics, oceanography, meteorology, geotechnical, conceptual designs, etc. ARCO has been a part of over 70 such projects (see Attachment #1). These research efforts have and will continue to aid in the developing technologies that allow industry to operate safely and efficiently in the Arctic.

This industry research goes on at an international level as well through groups like the Arctic Petroluem Operators Association (APOA), a Canadian industry association. ARCO has been a part of 15 such projects (see Attachment #2). Through this group, U. S. Companies have had access to the results of Canadian studies such as one on the effects of petroleum-related operations on marine mammals. Another study undertaken by an alliance of U. S., Canadian, and Eskimo groups will document the behavior of the bowhead whale and the impact, if any, of industry operations on their migratory patterns.

Rather than set up a federal body to coordinate Arctic research, it would be more cost-effective to utilize the University of Alaska as a coordinating body with a steering committee made up of experts from government, academia, and industry. In addition, a better means of funding Arctic research would be to give the National Science Foundation (NSF) or the National Oceanic and Atmospheric Administration (NOAA) 25 million dollars annually, earmarked for Arctic research.

We would like to thank the Committee again for this opportunity to provide written testimony on this proposed legislation.

Sincerely,

G. T. Wilkinson
Executive Vice President

ATTACHMENT 1

ARCO PARTICIPATION IN ALASKA OIL & GAS ASSOCIATION PROJECTS

PROJECT	TITLE
Project #1	Bristol Bay Environmental Report
Project #2	Sea Ice Investigations, Beaufort Sea
Project #3	Chukchi Sea - Arctic Coast Environmental and Ecological Data
Project #7	Beaufort Sea Ice Scouring
Project #10	Arctic Marine Terminal Facilities, Chukchi Sea
Project #11	Offshore Oil Terminal Structure Facilities in the Chukchi Sea
Project #12	Sea Ice Activity and Pressure Ridge Growth in the Beaufort Sea
Project #15	Manhattan Voyage Study
Project #16	Arctic Tanker Design Study
Project #17	Over Flights: Nome to Resolute
Project #18	Offshore Pipelaying on the Alaskan North Slope - Feasibility Study
Project #19	Characteristics and Distribution of Nearshore Permafrost, Beaufort Sea
Project #20	Sea Ice Dynamics and Properties, Beaufort Sea
Project #21	Arctic Oil Biodegradation
Project #23	Artificial Ice Island Feasibility Study
Project #25	Bering and Chukchi Seas - Feasibility Study of Production Operations and Marine Crude Transportation During Ice Covered Periods
Project #27	Ice Movement Study for Winter, 1975-1976 Beaufort Sea

ATTACHMENT 1 - Page Two

Project #28	Aerial Reconnaissance 1974-1975 - Prudhoe Bay - Harrison, Point Lay and Kotzebue Sound and Ice Movement - Prudhoe Bay - Harrison Bay
Project #34	Feasibility of Constructing Artificial Gravel Islands, Beaufort Sea
Project #35	Summer Sea Ice Conditions, North Alaskan Coast
Project #37	St. George Basin Sea Ice Statistics from Satellite
Project #39	Beaufort Sea Ice Movement Study 1976-77
Project #41	Oil Spill Response in the Nearshore Beaufort Sea
Project #42	Beaufort Sea Ice Movement Study, 1977-78
Project #43	Aerial Mapping of 1978 Sea Ice in Norton Sound and Northern Bering Sea
Project #44	Beaufort Sea Wind, Wave, Currents
Project #45	Arctic Mobile Drilling Structure
Project #46	Study of Methods and Costs of Offshore Pipeline Installation and Trenching in the Beaufort Sea
Project #47	Yukon Delta Rubble Pile Investigation 1978
Project #48	Beaufort Sea Floor Geophysical Study
Project #51	Aerial Mapping of 1979 Sea Ice in the Norton Sound and Northern Bering Sea
Project #52	Beaufort Sea Ice Movement Study 1978-79
Project #53	Beaufort Sea Ice Movement Studies 3-Year Summary and Analysis
Project #54	Norton Sound and Northern Bering Sea Rubble Pile Investigation 1978-79
Project #55	Beaufort Sea First-Year Ice Survey
Project #56	Bering Sea Phase I Oceanographic Study
Project #58	Arctic Skimmer Final Design Project - Phase I Arctic Skimmer Design - Phase II

ATTACHMENT 1 - Page Three

Project #59	Arctic Dispersant Study
Project #62	Under-Ice Rig Noise-Measurement Program
Project #64	Bering Sea Aerial Photography Data - 1977
Project #65	Beaufort Sea Drilling Effluent Disposal Map
Project #67	GOAOC PROJECT--Group Oceanographic Survey - Gulf of Alaska
Project #69	GOAOC PROJECT--1973 Soil Boring Program
Project #71	GOAOC PROJECT--ARCO Cost Well
Project #73	GOAOC PROJECT--Oil-Spill Trajectory (Two Reports)
Project #74	GOAOC PROJECT--Socio-Economic Impact of Drilling and Production
Project #76	GOAOC PROJECT--Seismic Risk Analysis for the Gulf of Alaska
Project #77	GOAOC PROJECT--Superstructure Icing
Project #78	GOAOC PROJECT--1974 Ocean Current Measurement Program
Project #79	GOAOC PROJECT--Gulf of Alaska Hindcast Evaluation (WHEP)
Project #80	GOAOC PROJECT--Earthquake Soil Response Analysis
Project #81	GOAOC PROJECT--Gulf of Alaska Meteorological and Oceanographic Forecasting Program (MOFP)
Project #82	GOAOC PROJECT--Gulf of Alaska Wave and Wind Measurement Program (GAWWMP)
Project #83	GOAOC PROJECT--ARCO Cost Well
Project #84	GOAOC PROJECT--Gulf of Alaska Wave Hindcasting Pilot Study (GAPS)
Project #85	ASOC Project--Bering Sea - St. George Basin/ Western Bristol Bay Wave and Wind Measurement Program (BOMP)
Project #87	Yakutat Wave Data

ATTACHMENT 1 - Page Four

Project #89	Kodiak Shelf Geotechnical Soil Boring and Sampling Program
Project #90	St. George Basin COST Well
Project #98	Feasibility Study of an Air Cushion Drilling System for Shallow Water Areas of the North Slope of Alaska
Project #100	Beaufort Sea Geotechnical Interpretation, Supplemental Study
Project #102	Beaufort Sea Freeze-Up Movement Study - 1979
Project #103	OSI Stress Sensor Study
Project #104	OSI Beaufort Sea Oceanographic Measurement Program, 1979
Project #105	Seismicity of Offshore Alaska Regions (SOAR) Program
Project #106	Arctic Cone Test Structure - Phase I
Project #107	Large-Scale and Small-Scale Ice Strength Measurement
Project #109	Level Ice and Pressure Ridge Characteristics During USCGC Polar Star Deployment in Bering and Chukchi Seas
Project #110	Bering Sea Ice Aerial Mapping - 1980
Project #111	Aerial Mapping of Sea Ice in the Chukchi Seas, 1980
Project #112	Bering Sea Ice Features
Project #113	Conical Structure Test Program, 1979-80
Project #114	Ice Stress Sensor Verification
Project #115	Geotechnical Considerations of St. George Basin, Offshore Alaska
Project #118	Beaufort Sea Breakup Study - 1980
Project #119	Beaufort Sea Oceanographic Measurement Program, 1980
Project #120	Acquisition and Interpretation of SLAR Ice Imagery in the Prudhoe Bay Area

ATTACHMENT 1 - Page Five

Project #121	Preliminary Design of an Arctic Cone Test Structure with Indirect Load Measurement
Project #122	Offshore Alaska Seismic Measurement Program
Project #123	Level Ice and Pressure Ridge Data Collection During 1981 POLAR SEA Deployment
Project #126	Slope Protection Design Development for Beaufort Sea Island
Project #127	Bering/Chukchi Seas Ice Concentration Study
Project #128	Speed and Ice Depth Sonar
Project #129	1980 Freezeup Study of Barrier Island Chain and Harrison Bay
Project #130	Large Scale Ice Strength Tests 1980-81
Project #131	Harrison Bay Ice Movement Study
Project #132	Lower Cook Inlet COST #1 Well
Project #133	Reindeer Island Stratigraphic Test
Project #134	Norton Basin COST #1 Well
Project #135	Acquisition and Interpretation of SLAR Ice Imagery for the Bering Sea Area
Project #137	Feasibility of a Year-Round Offshore Loading Terminal in Norton Sound
Project #138	Statistical Data on 1981 Beaufort, Chukchi and Bering Sea Ice Ridging Using a Laser Profilometer
Project #139	Beaufort Sea Multiyear Ice Features Study (BMIFS)
Project #141	Protection of Offshore Arctic Pipelines
Project #142	Bering Sea Oceanographic Measurement Program
Project #143	Mechanical Ice Properties of Sea Ice
Project #144	SAR 1981 Data of Beaufort and Chukchi Sea Ice
Project #147	Beaufort Sea Oceanographic Study, 1981

ATTACHMENT 1 - Page Six

Project #150	1981 Bowhead Whale Population Study
Project #152	Punching Shear Resistance of Concrete Structures
Project #155	Evaluation of Artificial Islands for Norton Sound
Project #159	Preliminary Design for Icebreaking Tankers for the Bering Sea
Project #160	1981 Freezeup Study of Barrier Island Chain and Harrison Bay
Project #163	Synthesis of Bering Sea Ice and Current Information for the Norton and Navarin Basins
Project #165	Digitizing and Analyzing Airborne Laser Profilometer Data of Arctic Sea Ice
Project #166	Norton Sound Ice Behavior Study
Project #168	Air Curtain Destructor
Project #170	Beach Clean-Up Machine
Project #175	1982 Level Ice and Pressure Ridge Characteristics in Bering and Chukchi Seas During Deployment of USCGC POLAR STAR

ATTACHMENT 2

ARCO PARTICIPATION IN APOA PROJECTS

Project Number:	Title:
75	First Year Sea Ice Ridge Study
82	Small Protype Cone Test
85	Adfreeze on Conical Structures
86	Study of Pressure Ridge/Cone Interaction
87	Mathematical Model In Ice/Cone Interaction
91	Field Study of Multi-Year Ice Pressure Ridges
104	Conduct In-Situ Ice Pressure Around Artificial Islands in Southern Beaufort Sea Phase I
105	Conduct In-Situ Ice Pressure Around Artificial Islands in Southern Beaufort Sea Phase II
109	Modelling of Ice Pile-Up and Ridge-Up on Islands
110	Design Studies of Conical and Cylindrical Bottom Founded Structures for Southern Beaufort Sea
125	Experimental Ridge/Caisson Retained Island Interaction
143	Ice Field/Caisson Retained Island Interaction
171	1980 Investigation of Ice Conditions - Issungnak Island
175	Acoustic Ice Thickness Measurement System
178	Ridge Building Model Tests

Calista Corporation
516 Denali Street, Anchorage, Alaska 99501 (907) 279-5516

June 3, 1982

The Honorable Ted Stevens
U.S. Senate
127 Russell Senate Office Building
Washington, D.C. 20510

ATTN: Tonja Musko

Dear Senator Stevens:

We have reviewed S.1562, the Arctic Research and Policy Act, a bill that was introduced by Senator Frank Murkowski co-sponsored by yourself and Senator Scoop Jackson.

Our comments on this bill are limited. However, we feel that it is a step in the right direction. Our major concern with this bill is absence of any proviso which would lead to a coordinated approach toward outer continental shelf (OCS) oil and gas development. By this, we mean that while the Department of the Interior has a general policy toward OCS development, what is lacking a policy that takes into account the total west coast of Alaska. That is, what happens in Sub Arctic Area may have a direct and corresponding impact in the Arctic Area. This must be taken into consideration.

Additionally, the Council should have at least one representative from the subarctic regions. (outside of Central and Southeast Alaska)

Thank you for giving an opportunity to state our views of S.1562. Thank you for your kind consideration.

Sincerely,

CALISTA CORPORATION

Alex Raider
President

cc: The Honorable Frank Murkowski
The Honorable Henry Jackson
The Honorable Don Young

EXXON COMPANY, U.S.A.
POST OFFICE BOX 2180 · HOUSTON, TEXAS 77001

PRODUCTION DEPARTMENT

H. J. LONGWELL
OPERATIONS MANAGER

June 14, 1982

The Honorable Senator W. Roth
Chairman - Senate Governmental Affairs Committee
Washington, D. C.

Dear Senator Roth:

We appreciate your invitation of May 21, 1982 to Mr. C. D. Roxburgh to testify at the hearing of the Senate Governmental Committee regarding S.1562, the Arctic Research Policy Act. Although we must respectfully decline this invitation, we would like to express our view of the modified bill (printed amendment #1453).

As you are aware, Mr. Richard H. Weaver, Exxon Company, U.S.A., Alaska Operations Manager, presented testimony on behalf of the Alaska Oil and Gas Association (AOGA) at the hearing of S. 1562 in Fairbanks, Alaska, on April 7, 1982. The thrust of that testimony was that: (1) there is not a need to establish a high-level Arctic Research Committee, (2) the requirements for permit applicants to fund research deemed necessary to answer all environmental questions raised by their applications would be counterproductive, and (3) the Naval Arctic Research Laboratory (NARL) in Barrow can be maintained as a field experiment station and logistics support base without this legislation. Exxon continues to support that testimony, but we also recognize the changes that have been made in the bill to make it less objectionable by reducing its potential for impeding petroleum development in the arctic.

Exxon appreciates the changes that Senators Murkowski, Stevens, and Jackson have made in the original bill. We endorse the deletion of the provision that would have required a permit applicant to fund research in that this deletion will eliminate a potential regulatory constraint which could have impeded development of oil and gas resources in Alaska. We also feel that the changes to the Arctic Research Commission to emphasize technical expertise and to include resource industry personnel would be beneficial.

Insofar as the oil and gas extraction industry is concerned, we still do not believe that it is necessary to establish a council-level body to oversee arctic research activities. An informal working-level committee, as recommended in the AOGA testimony, could function effectively to discuss plans for arctic research and to optimize the roles of the various sectors but without the funding and high-level council that would be implemented under this bill. This committee, which would include representatives from government, industry, and academia, could operate in a manner similar to the effective ad-hoc groups that have been assembled for OCS pre-sale synthesis meetings.

Exxon supports the improvement of the efficiency of arctic research activities. We feel, however, that this goal should be achieved within the framework of existing governmental agencies without enacting the proposed legislation.

We appreciate the committee's interest in obtaining Exxon's input on this proposed legislation and hope that the comments made here will be of value for further deliberations of S. 1562.

Sincerely,

Henry J. Longwell

RHW/WEH:ms

c - Senator Frank H. Murkowski
Senator Ted Stevens
Senator Henry M. Jackson

The University of Iowa
Iowa City, Iowa 52242

Department of Physiology and Biophysics
(319) 353-4152

1847

June 11, 1982

The Honorable Theodore Stevens
United States Senate
Committee on Governmental Affairs
Washington, D.C. 20510

Attention: Ms. Tonja Musko
Re: S-1562, Arctic Research and Policy Act

Dear Senator Stevens:

Thank you for asking me for written testimony concerning the Arctic Research and Policy Act. I understand from Tonja Musko that I may be asked to answer questions at the hearing. I will be very glad to do this. I had written to you a letter of testimony on August 1, 1980. I enclose a copy of this letter.

I have in my files six published articles, all of which recommend that the Naval Arctic Research Laboratory be reactivated. In all of these articles, there is one central point which has not been emphasized. I will do that now. It concerns the training of Arctic scientists.

An Arctic Program and the Naval Arctic Research Laboratory will provide a continuously renewed pool of young people interested in and capable of working in Arctic climates. This is of considerable military importance. We should call attention to the fact that currently some 9,000 British troops have landed in an area without shelter where there are very strong winds, snow, and cold weather at this time.

At the outbreak of World War II, one of the first events in academic circles was that the following individuals who had experience in Arctic Alaska were given commissions so that they could help the military effort. These individuals were Professors Laurence Irving, Pete Scholander, D.B. Dill, Ronald Ferry, Donald Griffin and many others. We must continue to train a similar source of workers who can be called upon in case of a national emergency. I assure you that, when individuals who do not like the Arctic climate are assigned there, the system in which they work is a failure.

It is probably true that all of the 22 students whom I took there, at the time of a new national emergency, would be eager and willing to serve on the shore of the Arctic Ocean, because they are interested in and capable of working in Arctic climates. Up to about 1976, approximately 250 scientists per year went to Point Barrow to work. After that time, practically no scientists went there to work. You can see there is now a considerable deficit in providing the pool of young people interested in and capable of working there.

Thank you very much for your attention to my suggestions.

Cordially yours,

G. Edgar Folk, Jr.
Professor

Encl.

August 1, 1980

The Honorable Theodore Stevens
United States Senate
Washington, D.C.

Dear Senator Stevens:

This letter records some of the arguments which have not yet been used that favor keeping the Naval Arctic Research Laboratory activated at Point Barrow, Alaska. My justification in writing this letter is that I worked at this Laboratory for periods of time varying from one month per year to a full year, for 17 consecutive years. We have published approximately 50 papers or preliminary reports concerning the data which we collected at the Laboratory, and have taken 22 students or young investigators at various times to work at the Laboratory.

I feel that every effort should be made to keep this Laboratory active for the following reasons:

1. We must continue accumulating encyclopedic knowledge about the animals and plants of all regions of the globe. Because Americans own one of the critical areas of Arctic shoreline, it is even more important for us to collect encyclopedic knowledge of the living organisms of that area. Encyclopedic knowledge is necessary for the following reasons: if it is necessary to make use of substances obtained from an unusual animal or plant, the analysis and information about that substance must be carefully documented in reference books already at hand. For example, cortisone was initially extracted from a Mexican yam because a plant physiologist had already placed in a reference volume the information that this plant contained molecules like cortisone. A second example would be the fact that a queer animal in South America (the capibara) is now known to have in its blood a factor which is useful to prevent leukemia. This application was only possible because the curiosity of a biologist recorded in an encyclopedic approach, the facts about the very unusual blood of this animal. Thus, the study of lemmings, polar bears, and other Arctic animals at the Naval Arctic Research Laboratory is an important part of the absolute necessity of the scientists of the United States to continue accumulating encyclopedic knowledge.

2. Even more importantly, the Laboratory provides a pool of young people interested in and capable of working in Arctic climates. We must have this source of workers who can be called upon in case of a national emergency. I assure you that when individuals who do not like the Arctic climate are assigned there, the system in which they work is a failure. However, it is probably true that all of the 22 students whom I took there, at the time of a national emergency, would be eager and willing to serve on the shore of the Arctic Ocean.

I understand that there will be an inter-agency study to review the potential uses of NARL. If I may be of assistance at the time of this inter-agency review, please call upon me.

Cordially, yours,

G. Edgar Folk, Jr.
Professor

BEST COPY AVAILABLE

The University of Iowa
Iowa City, Iowa 52242
Department of Physiology and Biophysics
(319) 353-4182

June 23, 1982

The Honorable Theodore Stevens
United States Senate
Committee on Governmental Affairs
Washington, D.C. 20510

Attention: Ms. Tonja Musko
Re: S-1562, Arctic Research and Policy Act

Dear Senator Stevens:

You have from me written testimony concerning the Arctic Research and Policy Act, consisting of a letter of August 1, 1980, and a letter of June 11, 1982. Thank you for inviting me to the hearing on June 17. I wish to discuss the testimony of Dr. Nancy Davis.

A major point that she made was that the Arctic Research and Policy Act should be directed toward those scientists who live in Alaska. This is an important point, and I subscribe to it because when a major outside effort is directed toward Arctic science, the scientists living in Alaska could become neglected. However, this should not be carried too far. This Arctic Research Act is concerned with polar problems. Note that few scientists actually live above the Arctic Circle whether they are Alaskans or from the lower states. Both Antarctic research and Arctic research is apt to be accomplished by scientists penetrating this hostile environment for a few months or for a few years at a time, but they do not live permanently above the Arctic Circle. In my program, I twice had students live at Point Barrow for a full two years, specifically Dr. Gessaman and Dr. Berberich. This is a much better system than having native Alaskans who live in Juneau or Sitka, come up to the Arctic Ocean shore sporadically or periodically.

After an individual gains Arctic experience, he or she may live in a temperate climate but this does not mean they are less interested in or less capable of tolerating the Arctic climate. For example, it would be a mistake to think that Gary Laursen is less interested in Arctic science just because he is living in Washington, D.C.

Transportation is very good to Point Barrow, and scientists are delivered there efficiently from both Alaska and from the lower 48. For example, for many years I went to our airport for this University at 7 AM and was in my laboratory at Point Barrow at 11 o'clock that evening, unpacking our equipment. This schedule is not much different for those resident scientists who travel from Juneau or Anchorage to Point Barrow. In other words, it is more important to find those individuals who are interested in and dedicated to Arctic science, than to emphasize the use of those individuals who live in Alaska.

Dr. Davis made a very good point about the necessity of information and coordination of Arctic research. I think they have a good start at the Arctic Environmental Information and Data Center. As a biologist, I can say that we had little difficulty in coordinating the work at several Eskimo villages, partly because of information provided by the Anchorage Data Center. I would suggest that the Arctic Research and Policy Act should provide for enlargement and revitalization of the Arctic Environmental Information and Data Center.

In my final point, I call attention to the Arctic Program of West Germany. They have devoted considerable energy to their polar programs and now are building an Institute which will accommodate 150 people; they have plans to accommodate later another 250 polar scientists. It seems strange that West Germany can give this much attention while the United States is neglecting this Arctic area. Details of the West German program are enclosed.

Thank you very much for your kind attention to these suggestions.

Very sincerely,

G. Edgar Folk, Jr.
Professor

cc: Gary Laursen

ARCTIC AND ANTARCTIC PROGRAM OF FEDERAL REPUBLIC OF GERMANY (FRG)

ORGANIZATION AND SUPPORT

The new FRG polar research program has been implemented through the research programs of various universities, federal and state research institutes, and private research organizations. Support has come mainly from government agencies, including the Federal Ministry for Food, Economy and Forests, the Federal Ministry for Research and Technology, and the Federal Ministry for Trade.

THE ALFRED WEGNER INSTITUTE FOR POLAR RESEARCH

The polar institute was founded in Bremerhaven in 1980 and named for the famous geophysicist, Alfred wegner, who died on the Greenland ice in 1930. The institute currently occupies temporary offices, but construction of a building to accommodate 150 people, including researchers and students, will begin in 1984. There are plans to accommodate another 250 people. The institute is governed by a board of representatives from the federal and state governments and the scientific and business communities plus others. A scientific council advises the board.

Purpose.—The most important objective of the polar institute, apart from serving as a national center for coordinating research activity and information, is to serve as an independent research center that promotes international cooperation.

The institute also intends to conduct meteorological research in the polar regions. The changing conditions between shelf ice, sea ice, atmosphere, and open sea, and the influence of these upon the temperature and circulation of air and water masses will be studied through measurement programs and mathematical models. The FRG polar research ship is being specially equipped for such work. The meteorological program of the institute will be conducted in cooperation with other research institutes and the German Weather Service.

The polar ice is a good indicator of climatic trends and oscillations. Climatic variations are related to the growth and recession of the arctic and antarctic ice masses. This can be seen in marine sediments and beach deposits. For this reason metorologists, geologists, and glaciologists will examine such interrelations and the oceanographer will try to compare through their findings the sea currents of earlier times with those of today. Another area of interdisciplinary cooperation lies in bringing together oceanography and biology through research into the environment of the polar seas.

Although antarctic research will be stressed during the next few years, the program of the FRG polar institute is oriented toward research in both polar regions. The use of the polar research ship in the arctic, a series of bipolar comparative experiments, and the use of arctic, antarctic, and alpine ice fields for equipment tests have already been planned.

[From the Tundra Times, June 9, 1982]

RESEARCH LAB MODEST BUT VITALLY IMPORTANT

Compared to the Naval Arctic Research Laboratories a few miles north, the North Slope Borough's new scientific research laboratory in Browerville looks very modest, but right now the Borough's research lab means a lot more to the scientific community than NARL, simply because the Borough's lab is open and NARL is closed.

Mayor Brower recognized "that at the worst possible time the federal government took away all the science facilities on the North Slope," says North Slope Borough Environmental Protection Office Researcher Ray Dronenburg. "The new facility meets a desperate need."

As an example, Dronenburg cites the recent visit of a Dr. Erich Follman.

"Dr. Follman is studying rabies which is of critical concern, to the people of the North Slope. He came up to examine fox carcasses. He would have had no other place to do this before. Now, we have a research facility which can respond to the needs of the scientific commmunity."

Even on-going attempts to reopen NARL do not detract from the immediate importance of the Borough's research lab. Dronenburg's points out that while the NARI question drags on other decision are being pushed through, like increased oil drilling and seismic testing in the Beaufort Sea.

Meanwhile, only the Borough seems willing to commit resources to studying the consequences of such decision. Dronenburg is proud of the Borough facility but admits that due to the cost of laboratory equipment it may be awhile before it is completely stocked. He says the Borough has applied for equipment from NARL but while they wait. "It doesn't make you feel good to know you're going without equipment that is setting a few miles north gathering dust. They have a full X-ray lab at NARL but we can't touch it. It's there but its unavailable."

The Alaska Department of Fish and Game has expressed a great interest in obtaining a permanent place within the lab, from which they can conduct many of their on-going projects that involve the North Slope Borough and its resources. The University of Alaska also has shown interest in using the lab."

"We had a doctor call and ask if it would be possible to use the laboratory for a logistics base while conducting research on the birds which inhabit the Slope. He would have to bring three incubators with him in order to do so and stated that he was willing to donate the incubators to the lab in exchange for the privilege of using it," says the EPO researcher.

The Borough's Environmental Protection Office will be responsible for operating the lab under the direction of Dr. Tom Albert, Science Advisor.

Dr. Albert will be using the lab himself as a base of operations as well as a number of visiting scientists. In addition to the Borough's Whale Census and Inupiat Marine Science Training Program is now using the facility as a logistics base.

The Borough's Environmental Protection Office will be responsible for operating the new research facility. It was completed early this year and already has seen heavy use. Besides a number of visiting scientists, it provides a base of operations for North Slope Borough Science Advisor Dr. Tom Albert.

So it may look small compared to NARL but measuring by present activity and importance, the new North Slope Borough Research Laboratory takes on monumental proportions.

KAWERAK, INC.
P.O. BOX 948 • NOME, ALASKA 99762
(907) 443-5231

June 15, 1982

U.S. Senator Ted Stevens
ATTN: Tonja Musko
127 Russell Senate Office Building
Washington, D.C. 20510

Honorable Ted Stevens:

Following comments are directed to S.1562, the Arctic Research and Policy Act. There should be another purpose that the Congress should consider and that is; The renewable resources of the Arctic, specifically marine mammals and their food web, represent the subsistence and well-being of the Natives of Alaska, who totally rely on them for their nutrition and economics, without alternatives.

There should be a policy to study ice, not only as an obstacle to overcome, but ice as a supporter of marine life. Tanker traffic will someday be coming through our way and they will be most likely to be going in open leads, and that open leads is used by different marine mammals and wintering birds. Research should be conducted to minimize the devasting impacts.

On Arctic Research Commission appointment, the Eskimo Walrus Commission and the Alaska Eskimo Whaling Commission should have a seat, because both are very familiar with the Arctic and represents both native agencies.

Sincerely,

Matthew Iya
Staff to the Eskimo Walrus Commission

NANA REGIONAL CORPORATION, INC.
P.O. BOX 4—U, ANCHORAGE, ALASKA 99509
TELEPHONE (907) 248-3030

March 26, 1982

The Honorable Frank H. Murkowski
United States Senate
Room 15B
Russell Senate Office Building
Washington, D.C. 20510

Dear Senator Murkowski:

NANA Regional Corporation, Inc. was contacted by Senator Steven's staff here in Anchorage on Senate Bill 1562, a bill to provide a frame work for developing a comprehensive policy dealing with National needs and objectives in the Arctic.

Although NANA will be unable to participate in the hearing on the Bill scheduled for April 5 in Fairbanks, we would suggest that consideration be given to broadening Section 5 of the Bill to insure that all regions of the Arctic (Bering Straits, NANA, Doyon, and Arctic Slope) are included in the scope of the programs that may be carried out under this legislation.

We appreciate the opportunity to comment and your continuing interest in the Arctic regions of our State.

Sincerely,

Don Argetsinger

Don Argetsinger
Vice President

DA/mc

cc Tanya Musko
Senator Stevens' Anchorage Office

Member Villages: Ambler, Buckland, Candle, Deering, Kiana, Kivalina, Kobuk, Kotzebue, Noatak, Noorvik, Selawik, Shungnak

NORTH SLOPE BOROUGH

June 10, 1982

Chairman William V. Roth, Jr.
Senate Committee on Governmental
  Affairs
3306 Dirksen Senate Office Building
Washington, D. C. 20510

RE: Hearings on S. 1562, The Arctic Research Policy Act

Dear Mr. Chairman:

The residents of the North Slope Borough of Alaska are pleased to see the continued interest of your Committee on S. 1562 which would establish a Federal program for coordinating and implementing Arctic research. I ask that this letter be included in the record of your June 17, 1982, hearing on S. 1562.

This nation's research efforts regarding development of the Arctic energy and other resources is an extremely important issue for the Native community of the Arctic and all of the residents of the North Slope Borough. We have appreciated very much the efforts of Senators Stevens and Murkowski, as well as yourself, to bring together the many diverse governmental and non-governmental organizations with an interest in Arctic research and to develop an appropriate management organization to coordinate their activities, as has been proposed in S. 1562. The North Slope Borough testified at the field hearing in Alaska on April 7, 1982, and supported the concept of the legislation. We are submitting these additional views to reinforce our previous comments and to offer suggestions regarding changes to the amended version of the bill which Senator Murkowski introduced on May 19, 1982.

1. Views of the Inuit Circumpolar Conference (ICC).

We were gratified to hear that the Committee will receive testimony on this legislation from Mr. Hans-Pavia Rosing, President of the ICC. The Inuit of the North Slope of Alaska are members of the ICC and are active supporters of this new organization. The ICC resulted, in great part, from the efforts of our late Mayor Eben Hopson to bring together in one organization the various Inuit communities along the Arctic rim who share the same cultural heritage notwithstanding their

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OFFICE OF THE MAYOR, P.O. BOX 69, BARROW, ALASKA 99723, (907) 852-2611

different national affiliations. The ICC provides a structural framework within which Arctic Natives can contribute more effectively to the many issues facing the Arctic. As the principal permanent inhabitants of the Arctic, the Inuit provide a unique perspective and have intense personal interest in the impact of development of the Arctic resources on their homelands. Thus, they are interested in the research issues that will be addressed by this legislation.

The ICC is a growing organization which is currently applying for recognition by the United Nations to allow it to be more effective within the international community. We believe the ICC will be a strong, constructive voice in the coming years for Arctic issues. The Inuit of the North Slope of Alaska support the testimony of Hans-Pavia Rosing, which illustrates the importance of Arctic research issues to the entire Arctic Native community. The development of a coordinated Arctic research policy is, thus, important to the United States for its international implications as well as its domestic value.

2. Selection of Members of Arctic Research Commission.

The amended version of S. 1562 creates a three-member Arctic Science Council which then appoints a nine-member Arctic Research Commission. We believe this makes for a stronger management structure to address the research issues within the scope of the legislation. We are, however, concerned about the procedures for selecting the membership of the Commission.

The bill proposes that two members of the Commission be appointed "from among individuals familiar with the Arctic and representative of the needs and interests of Arctic residents." §6(b)(1)(B). It is our view that individuals from the Native community are best qualified to represent the residents of the Arctic, inasmuch as Natives constitute the majority of the permanent residents in the Arctic. The legislation is not sufficiently specific, however, to insure that such individuals will be appointed.

The active involvement of the Native community is essential for the Commission to perform its functions and achieve the goals outlined in the legislation. The nation's research policies need the contribution of people who encounter the Arctic environment on a full-time basis and have the experience of generations in their understanding of Arctic conditions. A major element of the nation's Arctic research policy should be to include adequate research to assess the impact of the anticipated energy and other resource development of the Arctic on the Native culture and lifestyle as well as on the fragile Arctic environment. Therefore, it is essential that the Commission include representatives of the persons most knowledgeable of those conditions.

We recommend that the bill be revised to provide that two members be appointed from the permanent Native residents of the Arctic familiar with the areas of greatest potential development activity. Because the bill provides for staggered terms, we also suggest that the bill provide that, among the various groups making up the Commission, the appointments vary so that each group will have at least one of the longer appointments to insure continuity of the membership. As the group most directly affected on a daily basis by the issues which are the subject of this legislation, we cannot over-emphasize the importance of the bill insuring that the Commission include Native members.

3. Research on Native Culture and the Arctic Environment.

The Purposes and Goals section of the amended bill reflect the many important considerations of Arctic research and the need for a coordinated national Arctic research policy. They emphasize the national implications of the Arctic research effort. This is not just an Alaska or a North Slope of Alaska bill. Many vital interests will be served by the increase in Arctic research and the coordination of those research efforts. These include national defense, energy development, commercial development of Arctic resources, environmental protection, transportation, technology development, and preservation of Native culture. The development of a cohesive Arctic research program is, thus, in the interest of all Americans who will benefit from future activity in the Arctic.

The potential adverse impacts of such activity, however, will be primarily local - on the fragile Arctic environment and on the culture of the Native residents who must deal with the disruption that unavoidably accompanies any development. A major goal of the research will be to enhance our understanding of the Arctic environment to insure that development takes place in a manner most protective of the land and water, of the fish and wildlife that inhabit the area and with an understanding of the impact on the Native culture. In addition to the goals already identified in the legislation, which we support, we request that the Committee include additional language stating that the Congress recognizes that the development of the Arctic must proceed with the maximum understanding of and consideration for its impact on the Arctic environment, fish and wildlife, and Native culture.

4. Use of the Naval Arctic Research Laboratory (NARL).

The proposed legislation provides for the Commission to undertake further analysis of the use of the Naval Arctic Research Laboratory to carry out Arctic research and to make a recommendation by March 31, 1983, with respect to NARL's continued operation. In the meantime, the bill provides that the Secretary of Defense is to maintain the facility to insure that it could be reactivated to perform valuable research functions. The North Slope Borough strongly supports continued operation of NARL. An effective Arctic research program requires a full service facility in the Arctic from which research activities can be undertaken. The NARL facility is well equipped and well located to perform that function. We hope that the Commission will eventually determine that NARL, which is the only such facility in the United States Arctic, is an integral element to an effective U.S. research program. We would like to see NARL reactivated as soon as possible but we understand the importance of additional study of the cost and other implications of using the facility and will actively participate in any such analysis by the Commission.

We believe that one of the major obstacles to the continuing operation of NARL has been its funding mechanism. Although a number of Federal departments and agencies as well as state and academic researchers have used NARL, and presumably still have an interest in using its facilities, funding has been limited to one department which does not use it full time. There is sufficient demand for the facility to justify its existence. It can be adequately supported financially if the groups using it pay a reasonable proportional cost for the facility or the cost is spread among a larger group of Federal agencies (and possibly other governmental and non-governmental organizations). Among the issues the Commission should examine is the development of an appropriate means of funding NARL.

An Arctic research policy is essential even if NARL were closed down. We believe, however, that the policy can best be implemented and the goals of the bill achieved were NARL's excellent facilities efficiently used. To implement the Arctic research which is essential to the United States, we need a full service research facility located in the Arctic, and NARL is the only logical facility meeting that test.

5. Establishment of Research Priorities.

The primary achievement of S. 1562, if enacted, would be to provide a central clearing house for information on Arctic research and a focal point for discussion and identification of the nation's Arctic research priorities. We the permanent residents of the Arctic have long noted the fragmented and incomplete, yet often duplicative, nature of the United States' research efforts. Many important research projects have been ignored in the past. The Council and Commission which would be formed by this proposed legislation could serve an extremely useful purpose by bringing together the various organizations conducting Arctic research and making informed recommendations regarding the direction of future research efforts. By having the Commission, with its diverse membership, identify research priorities after a full investigation of research done to date, the Congress will be providing valuable information to the organizations conducting research. It will give them guidance on future research activities and will help spotlight the importance of these research efforts for the nation as a whole.

We also consider it useful that the Commission would have some limited funds available to it to finance specific research where it determined that significant research projects are not being carried out by the primary research-oriented organizations. Although the principal purpose of the Council and the Commission should be to serve as a clearing house for research information and to identify national research goals and priorities, the ability for the Commission to initiate otherwise neglected research projects is a valuable function and one consistent with the overall goals and purposes of the statute.

CONCLUSION

I would like to restate the strong support of the North Slope Native community and the North Slope Borough for development of a national Arctic research policy. With the changes we have suggested above, S. 1562 can provide a framework that will lead to the development of an effective national program. This will be of benefit to the entire United States - the Federal government, the State government, scientific organizations, private industry and individual citizens. The Senate has made a significant contribution by its consideration of S. 1562. We urge the Congress to enact S. 1562 as national legislation at the earliest possible time.

We appreciate the opportunity to submit to you these additional comments and will be glad to provide any further information that would be useful to the Committee.

Very truly yours,

Eugene Brower

Eugene Brower, Mayor
North Slope Borough

cc: Senator Ted Stevens
Senator Frank Murkowski

NORTH SLOPE BOROUGH

September 24, 1982

The Honorable Frank Murkowski
United States Senator
Washington, D.C. 20510

Dear Senator Murkowski,

The attached letter provides North Slope Borough comments on Amendment #1453 to S.1562, the Arctic policy legislation. While I realize that Amendment #1453 is no longer the working version of this legislation, I wish to have on record the Borough's response to Amendment #1453.

Thanking you for your attention to this matter, I remain

Sincerely,

Eugene Brower

Eugene Brower, Mayor
North Slope Borough

Attachment: 1

cc: ✓Senator Stevens
Senator Roth
Congressman Don Young

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NORTH SLOPE BOROUGH

OFFICE OF THE MAYOR

P.O. Box 69
Barrow, Alaska 99723

Phone: 907-852-2611

Eugene Brower, Mayor

September 8, 1982

The Honorable Ted Stevens
United States Senator
Washington, D.C. 20510

Dear Senator Stevens:

The Ukpeagvik Inupiat Corporation administration has brought to my attention numerous discrepancies between S.1562 and its subsequently amended versions. These discrepancies were not noticed by my staff in their preparation of the recently published Arctic Policy Review, which gave our unqualified support to this legislation.

However, after lengthy discussion with Dr. Robert Harcharek, a member of my Task Force on national issues, and Vice President George Ahmaogak of the Ukpeagvik Inupiat Corporation, we regretably must withdraw our support of S. 1562 as subsequently amended. Furthermore, the North Slope Borough will publish a retraction to the recently published Arctic Policy Review. The amended versions of S. 1562 are untenable, and we hereby request that the Senate Governmental Affairs Committee not approve this legislation as presently drafted.

We are the indigneous people of the Alaskan Arctic. Our ancestors have occupied this land for countless generations. We have, for a long time, recognized the need for a coherant, comprehensive Arctic research policy for the United States. It was for that reason that we supported the introduction of S. 1562 on 31 July 1981.

The original legislation struck a paper balance between the need for Arctic research geared toward national defense and resource development activities, while recognizing the need to preserve and protect our cultural values and subsistence lifestyle. We were extremely pleased that the original version of S.1562 expressly provided for genuine consultation with, and input from, the Inupiat in the decision making process.

Unfortunately, S.1562 as subsequently amended, no longer strikes this balance. All references to Alaskan Natives and their concerns have been deleted from the present version. Instead, the bill has become a thinly disguised vehicle for research activities designed to promote the commercial exploitation of Alaska's energy and wildlife resources, and national defense activities, with apparently little regard for the impacts of these activities on the residents of the Arctic.

We do not oppose all national security or resource development activities in the Arctic. However, we must reluctantly oppose S. 1562, as amended, since it promotes these activities with the apparent disregard for their effects on the native community. While we strongly believe in the need for an Arctic Research Policy, we believe that such a policy must be a balanced and equitable one. The current version of S. 1562 tips too far on the side of commercial exploitation of the Arctic's resources. It fails to take into account the needs and concerns of the Arctic peoples. Until the legislation can be satisfactorily amended, we strongly urge the Senate Governmental Affairs Committee's defeat of S. 1562.

Our specific concerns and criticisms of S. 1562, as amended will be discussed in a Policy Statement presently being prepared by Dr. Harcharek of the Ukpeagvik Inupiat Corporation. This statement of the Ukpeagvik Inupiat Corporation is endorsed by me and will be in your office in time for the Committee mark-up sessions scheduled for the week of 13 September 1982.

Thank you in advance for your consideration of these matters of intense concern for the residents of the Arctic.

Sincerely,

Eugene Brower

Eugene Brower, Mayor
North Slope Borough

cc: George Ahmaogak, Vice President, UIC
Dr. R.C. Harcharek, UIC

NORTH SLOPE BOROUGH

OFFICE OF THE MAYOR

P.O. Box 69
Barrow, Alaska 99723

Phone: 907-852-2611

Eugene Brower, Mayor

Incorporated July 2, 1972

September 29, 1982

Senator Frank Murkowski
United States Senate
Washington, D.C. 20515

Dear Senator Murkowski:

As you know, the North Slope Borough, as the local government for the indigenous people of the Arctic, has worked intensively for a number of months with you and your staff on the Arctic Research and Policy Act (S. 1562). I commend your efforts in developing legislation to effectively address the serious research needs facing the Arctic now and in the near future. Your and Senator Stevens' staff have been particularly effective in ensuring Borough input into both the legislation and the Senate report. As a result of their efforts, Senate Amendment 3721 to S. 1562 is legislation we can live with. The Amendment, however includes provisions which we do not enthusiastically embrace.

Recognizing there are many groups with their own particular interests to pursue in the Arctic, we realize that compromises have been necessary in developing the Arctic Policy legislation. While we anxiously anticipate a structure which can effectively respond to Arctic research needs, we find Senate Amendment 3271, as recently reported by the Senate Governmental Affairs Committee, is less than adequate in assuring: 1) that protection of the Arctic environment is a priority; and 2) that the indigenous people of the Arctic will be included on the Commission created by the Amendment.

I feel compelled to emphasize that the North Slope Borough is not opposed to reasoned development in the Arctic, nor do we intend to suggest, by objecting to the lack of environmental "Goals and Purposes" in Amendment 3271, that we wish to protect the Arctic by excluding resource development. Our concern is that currently S.1562 refers primarily to development of the Arctic and does not reflect the balance of interests the Borough has sought to achieve.

The Inupiat people have lived in the Arctic for centuries and, thus, have developed a unique knowledge of the Arctic. To not assure Inupiat participation on a Commission which purports to review matters of critical importance to Arctic science, is simply an exclusion of a valuable human resource, and serves to disenfranchise the indigenous people of the Arctic from an important role in furthering Arctic research efforts. As you know, it is the Arctic areas bounded by the North Slope Borough and the Arctic Slope Regional Corporation, Calista, NANA and the Bering Straits Regional Corporation which will experience the greatest amount of mineral resource exploration and development in the next decade. An example of this is the fact that Interior Secretary James Watt has scheduled a lease sale in the Beaufort Sea which will occur in a matter of weeks. However, we know that the necessary empirical and scientific data do not currently exist to allow knowledgable projections of the positive and adverse consequences of such activities.

I submit the definition of the Arctic now in S. 1562 as the PYK-line is simply an attempt to expand an Arctic science bill to encompass areas which are removed from the Arctic. While I am sure there are scientific pursuits in other areas of Alaska which merit attention, by expanding the Arctic to include those areas, as in Amendment 3271, simply detracts attention, resources and funds from the one region in Alaska already experiencing potentially negative impacts from resource development including direct environmental damage. The Borough will fully support additional legislation focussed on research efforts in other areas of Alaska. However, at this time we believe that an Arctic science bill should be just that; that is, legislation focussed on the Arctic.

We are also concerned that the exclusion of NEPA may be interpreted too broadly. It is appropriate that the procedural administrative activities of the Council and Commission should not give rise to NEPA obligation. Actual research activities, however, should still be subject to NEPA to the extent it currently applies.

Attached is language for a Senate amendment which would answer some of our concerns, and I respectfully request your favorable consideration and sponsorship of such an amendment on the Senate floor. In an attempt to achieve final legislation which the Borough could unequivocally support, we plan to request that Representative Don Young introduce legislation in the House which would

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be more directly beneficial to the residents of the North Slope Borough and the Arctic. We plan to pursue this in the hope that the spirit of compromise regarding this legislation will continue, and the North Slope Borough will be able to wholeheartedly support the final legislation.

I anticipate your continued correspondence on this important matter.

Sincerely,

Eugene Brower

Eugene Brower, Mayor

EB/bns

cc: Senator Ted Stevens
    Senator Roth, Chairman,
      Governmental Affairs Committee
    Representative Don Young

AMENDMENT TO S. 1562

On page 3, after line 23, add new paragraphs (15) and (16):

(15) Arctic research has significant value for expanding knowledge of the Arctic which can enhance the lives of Arctic residents, increase opportunities for international cooperation among Arctic rim countries, and foster a national policy for the Arctic;

(16) the Alaskan Arctic provides essential habitat for marine mammals, migratory waterfowl, and other forms of wildlife which are important to the nation and which are essential to Arctic residents.

On page 16, line 6, after the word "activities," insert "of the Council or Commission."

NUNAM KITLUTSISTI
"Protectors of the Land"
P.O. Box 267 • Bethel, Alaska 99559
(907) 543-2856

June 25, 1982

Senator Ted Stevens
United States Senate
ATTN:Tonja Musko
127 Russel Senate Office Bldg.
Washington, D.C. 20510

Dear Senator Stevens,

First, I must apologize for the lateness of my response to your letter of May 26, seeking my comments on S. 1562, the Arctic Research and Policy Act. I am currently residing in Chevak for the summer prior to our leaving to Virginia for graduate studies, and my mail finally caught up with me.

I was very pleased with the amendment language introduced by Senator Murkowski, and would like to include several technical amendments, and one discussion point.

Under Findings and Purposes, I would suggest that Section (10) be renumbered #11, and new section #10 be included that specifies that an additional finding of Congress is that the Native peoples of the Arctic rim states, and Alaskan Native peoples and their culture have sustained themselves since their establishment on the environment and resources of the Arctic, and that Congress declares its intention to seek protection for the Alaskan Native way of life through careful and diligent Government sponsored research in advance of national decisions influencing the Arctic and its ecology, so as to avoid where possible, and mitigate to practical extents, constraints on the Arctic's natural system during research and development of national interests in the Arctic.

The second issue involves Section 9, Arctic Reseach Fund. From my understanding of the current proposal by the Department of the Interior to share revenues of the Outer Continental Shelf with affected States, a replacing the Coastal Energy Impact Program, which has the support of many coastal states, this proposal may appear competative for the limited funds Congress may make available to help satisfy local complaints about expenses they will incure as impacts from Federal offshore development in oil and gas. S. 1562 singularly benefits the State of Alaska, and may further appear to other coastal States to be a special fund for Alaska. Arguements raised against S. 1562 have specifically cited the costs incurred by Government with its growing superstructure of guasi-governmental organizations for regulatory and research purposes. The DOI revenue sharing proposal directly tied to State performance and compliance on Federal OCS plans appears to bypass that arguement. From a rural Alaskan perspective, I would further add that Federal OCS revenue sharing with the State, with an earmark for affected coastal communities, is more attractive given the national effort to proceed on Alaskan frontier OCS development. The State of Alaska's Coastal Zone Management Program, and its district programs in both urban and rural areas, have been established for 5 years, and are operating on Federal CZM funds. I am sure that this Alaskan constituency would feel that S. 1562 purpose of withdrawing its funding from Federal OCS revenues would appear to diminish the Interior backed proposal for Federal OCS revenue sharing that these groups would participate in financially. Not fully understanding the dynamics of Congressional appropriations, I can only suggest this as a potential problem area, and I am unable to suggest to you an alternate vehicle that would satisfy coastal States while allowing for adaquate funding for the Arctic Science Policy Commission to accomplish its mission.

My third point references to the selection of members of the Arctic Science Policy Council and its Commission with the INPFC and North Pacific Fisheries Management Council. I fully welcome the statutory language requiring at least two of the Commission's members to be representative of the "needs and interest of Arctic residents," but feel that this language should be further strenghtened to specifically require that these individual be residents of the Arctic regions that they represent. As a representative of villages within the Yukon-Kuskokwim Delta on scientific research issues, I have been continually disappointed with Federal Councils and Commissions that select their "local" representatives from a pool of politically eligible state-wide leaders who often do not reside in affected areas. These individuals political usefulness in relation to their regulatory and advisory purposes is far outweighed by their political acumen, and a practicle disservice to rural communities exists.

The last point of discussion Senator involves the composition and function of the Council itself. In that the only arctic onshore and offshore environs under United States jurisdiction occur in the State of Alaska, I feel that a fundamental error has been made in the 1 membership of the Council.

The Federal domination of the Council will diminish its effectiveness. The State will feel little interest in sharing its resources and personnel with the Council with its diminished input. Cooperation in Arctic planning, best demonstrated by the joint Federal-State Beaufort sale, portends to a combining of government resourceson common issues in the future. I feel that the Council's composition will deter rather then promote this type of cooperation in the Arctic, crippling the Council concept, and worsen the situation of resident Arctic peoples who will be eventually washed aside in the wake of poorly designed National and International arctic development.

I hope that my points are helpful in your review of comments on S. 1453. I certainly support the bill, having lived through a succession of many dubious government efforts in the Arctic that would have benefited from serious attention from a blue ribbon commission that could force through intellectual and political strenght agencies and industry that are poorly informed, but bent on arctic development to properly plan and communicate their programs to allow for the least impact upon the people of the Arctic. I believe that S. 1562 amended may alleviate many of these problems in the future.

Sincerely,

harold.

harold sparck

SDSU
SYSTEMS ECOLOGY RESEARCH GROUP
DEPARTMENT OF BIOLOGY
COLLEGE OF SCIENCES
SAN DIEGO STATE UNIVERSITY
SAN DIEGO CA 92182-0057

(714) 265-[illegible]X-6613

03 September 1982

Senator Ted Stevens
Federal Bldg. & Courthouse
101 12th St. (Box 4)
Fairbanks, AK 99701

Dear Senator Stevens:

We have been conducting ecological research in the Alaskan Arctic since 1970. While not agreeing with all aspects of the wording of S.1562 I would like to support the general objectives of the bill. I hope that the result of this initiative will be a strong, coordinated, and well thought out Arctic research program fostering first quality research by the most qualified researchers from throughout the United States.

Sincerely,

Walter C. Oechel
Director

WCO:rw

Tanana Chiefs Conference, Inc.

Doyon Building
201 First Avenue
Fairbanks, Alaska 99701

Phone (907) 452-8251

June 25, 1982

The Honorable Ted Stevens
U.S. Senate Committee on Governmental
Affairs
Senate Office Building
Washington, D.C. 20510

RE: Additional Comments on Amendment 1453 to S. 1562, Arctic Research

Dear Senator Stevens:

Attached please find additional comments on Amendment 1453 to S. 1562. The Tanana Chiefs Conference, Inc. had also submitted comments following the April 7 hearing in Fairbanks, and we offer these additional comments at this time. Both sets of comments are intended please to be included in the hearing record for this proposed legislation.

Generally we do wish to emphasize that the approach taken in the bill is heavily oriented toward geophysical phenomena and those sciences which seems to ignore or omit the fact that indigenous peoples live in the Arctic.

The picture which is given is that a whole battery of research projects and researchers would be superimposed upon the Arctic in a way which is foreign to the region because it does not recognize, utilize nor involve itself so as to understand the rich cultural heritage and knowledge of the homeland region.

We do object to this approach and have attached our comments and suggested changes to improve the focus and content. This additional focus could also improve the end research products. It is true, for example, that to know and understand human Arctic survival techniques known and utilized by indigenous Arctic peoples - Athabascan and Eskimo - (as a result of an expanded research focus in the bill) could substantially improve overall Arctic research results.

Also, without this body of human knowledge we won't really understand what it is that we are trying to protect in the Arctic.

Thank you very much for the opportunity to offer these additional remarks.

Sincerely,

TANANA CHIEFS CONFERENCE, INC.

William C. "Spud" Williams
President
WCW:JK/1243n
attachment
J10a4

TANANA CHIEFS CONFERENCE, INC.
Comments on S. 1562,
Arctic Research and Policy Act
June 1982

The indigenous Arctic peoples of Alaska, Athabascan and Inupiat, as well as other Natives, represent two of our nation's oldest, richest cultures. As such, they have survived as a people many centuries in the Arctic, developing, retaining and utilizing a wealth of customs, knowledge, skills and information concerning life and conditions of the Arctic.

Utilizing the natural resources at hand, Arctic people have also evolved an economic system which is unique in today's Western World, but which is very poorly understood by this urban nation.

If one goal of such an Arctic research policy is to minimize damage to the Arctic, then there absolutely must be a focus for research in this policy which addresses the need to understand how people in the Arctic live, what are their uses of the land and resources, when, how and where are such resources utilized, and by whom.

This focus is totally missing from the Findings and Purpose of S. 1562.

Important too is the fact that human Arctic survival techniques are commonplace knowledge and practice of indigenous peoples of the Arctic. This knowledge, properly researched, is another aspect of the missing focus, and would add substantially to the Arctic data base S. 1562 wishes to establish.

"Properly researched" in our view means that the people would be the object of such research, who have already been extensively studied by scientists in the past, should actually participate in this research as employed researchers or project field technicians collecting data, for example.

J10g1

COMMENT BY SECTIONS

Amendment No. 1453: Findings and Purpose Sec. 2:

(11) (2) "---and retrieval of all (add) scientific data with respect to the Arctic;"

This addition recognizes that anthropological kinds of research, also as an area of scientific endeavor, is necessary to any "integrated" (see Duties of Council - (3) for this reference) science policy. Such science is totally absent in Amendment No. 1453. It should be added to and a part of the overall scientific focus of S. 1562.

To remedy this large focal oversight, add here:

(12) The Federal Government should also focus its efforts on the collection and characterization of basic data related to Arctic indigenous cultures and peoples, and special attention should be directed toward understanding the unique economic systems, traditional uses of resources, and age-old human survival techniques on land, water and the sea which is practiced by these people.

Arctic Science Policy Council Sec. 3:

No Arctic Science Policy Council should be in the business of making such policy without the participation of indigenous Arctic residents who sit on the Council as voting members. We suggest that a reasonable addition to Sec. 3 would be to: include each one area Athabascan and one Inupiat resident, to be appointed by the Governor from nominations received by Native Councils of all Arctic communities.

Duties of Council Sec. 4:

(1) "Facilitate cooperation between the Federal Government (and) State Governments and local Native Governments (add).

J10g2

This addition heads off the seemingly troublesome task of the State eventually, typically catching up with rural communitis very late, to let them know and/or participate in what's going on that affects them after it's all over.

Our suggested addition creates a direct line from Council to local Arctic Governments.

(3) "Develop and supervise an integrated (emphasis added) national Arctic science policy..." In no way is the policy outlined in Amendment No. 1453 to S. 1562 "integrated," not until Arctic science in S. 1562 includes those sciences which responsible study people are included, as suggested earlier herein.

Arctic Research Commission Sec. 6:

(A) "...(including, but not limited to, the physical, biological and social sciences..."

This language is the first evidence in Amendment No. 1453 that framers of the amendment had marginally in mind other science in addition to physical and biolgoical sciences. However, nothing earlier in Sec. 2 tracks this suggestion in Sec. 6, or even hints at the additional scientific focus which is now tacked onto amendment 1453 in Sec. 6 as a seeming afterthought. We urge those changes suggested earlier be made.

(B) Additionally, the "Two numbers shall be appointed from among individuals familiar with the Arctic..." should be further amended to specify indigenous Arctic residents, one Athabascan, one Inupiat, selected from nominations made by Arctic Community Native village Councils.

Definition Sec. 11:

We are pleased to the expanded definition of Arctic over the original version which now appears here in Amendment No. 1453. This is entirely correct and appropriate and tracks the suggestions which the Tanana Chiefs Conference made in its written comments to the April 7 hearing on the first version of this bill, namely, that Arctic and Arctic people live south of the Brooks Range, as well as on the Arctic Slope.

As a footnote to these specific comments and to reemphasize we are particularly hopeful that any such policy, through additions to and drafting refinements of this bill, can create internal structures which would achieve:

1) Direct lines of informational contact between scientists, commission, council and Arctic rural Native communities; and

2) a body of scientific knowledge utilizing indigenous peoples employed as researchers which helps to understand the human ecology of the Arctic, traditions of survival, land other resource use, and of the rural subsistence economy as a legitimate, thorough, unique economic system.

If Arctic Policy seeks - as it must - to develop without risking irreparable damage, then a focus of science must seek to know and understand the human Arctic homeland and how its cultures live before it could know what is risked and how and what to minimize, mitigate or avoid.

J10g4

WHALE CENTER

May 10, 1982

Senator Frank Murkowski
3306 Dirksen Senate Office Building
Washington, D.C. 20510

Dear Senator Murkowski:

While the Whale Center does not have the full details of SB 1562, we wholeheartedly endorse the concept. The Whale Center, a nonprofit conservation organization representing some 6000 people nationwide, is extremely concerned with the consequences of Arctic oil and gas development on the marine resources of Alaska. We believe that any bill which sets Arctic research as a national priority shows foresight and is a significant step towards wise management of the area's resources.

To ensure that this type of legislation succeeds, we urge you to include in the bill amendments which will guarantee sufficient funds to support Arctic research. The current Administration's proposals to cut federal spending underscore the need for legislative programs to have adequate alternative support to allow research continuity. Therefore, alternative funding sources such as the one suggested by North Slope Burrough's Major Brower (ie. seeking industry support) should be investigated.

We commend you on your support of this legislation and hope that you will continue to work to see that the objectives of this bill will be realized.

Sincerely,

Pamela Ferris-Olson
Research Associate

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